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ABSTRACT

The Learning with Otis program is designed to provide elementary school teachers with practical conservation education activities which should be infused into the existing curriculum on a regular basis. Although many of these activities are science-oriented, the program is not, and should not be considered a science curriculum exclusively. This activity book is the basic component of the program. It consists of lesson plans and student materials organized into eight topic areas: ecology; geology; soil relationships; land use; conservation ethics; wildlife; plants; and water and aquatic life. Each lesson plan includes: (1) the number(s) of Basic Essential Skills Test (BEST) objectives and conservation concepts fostered in the lesson; (2) specific lesson objectives; (3) a list of materials needed; (4) a glossary (called teacher resource words); (5) instructional strategies; (6) suggested student activities; and (7) when applicable, answers to student materials. Numbered lists of conservation education concepts and BEST objectives (for reading/language arts, mathematics, and government/economics) are included. The text for a conservation chart used with the first lesson on land use is included. (JN)

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LEARNING WITH OTIS

A Conservation Education Activities Book Grade 3

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LEARNING WITH OTIS

A Conservation Education Activities Book Grade 3

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"Otis" Created by

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**An Elementary School Conservation Education Program
of the
Missouri Department of Conservation
Conservation Education Unit
Education Section**

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We are indebted to Conservation Education Consultants Hollis Crawford, Gordon Griffin, Jim Pyland, Harold Thiele and Jack Woodhead for their assistance with program development. Thanks also to Elaine Callaway, conservation education projects coordinator, for her editing efforts.

Learning With Otis was developed for and is dedicated to the elementary school children of Missouri. We hope this program helps the children of today become better prepared to meet tomorrow's challenge of natural resource conservation. This conservation challenge should concern all of us, especially those charged with educating today's youth. Perhaps Otis will soon become the symbol of wise resource use and will aid Missouri elementary school teachers in meeting this challenge.

For additional information on conservation education programs and services, write the Education Section, Missouri Department of Conservation, P.O. Box 180, Jefferson City, Missouri 65102.

INTRODUCTION

The *Learning With Otis* program was developed exclusively for elementary teachers and their students. The program is designed to provide teachers with practical conservation education activities which should be infused into the existing curriculum on a regular basis. Used in this manner, conservation becomes an integral part of each child's total learning experience...a step toward conservation becoming "a way of life." While "science" activities are included, the program is not, and should not be considered a science curriculum exclusively.

Program Components

Activity Book

The *Learning With Otis* activities book is divided into eight relevant topics, or approximately one per month throughout the school year. Activity lesson plans are color-coded by topic for convenient reference. Each lesson plan lists the numbers of specific Basic Essential Skills Test Objectives, Conservation Concepts, and lesson plan objectives for that particular activity. The table of contents indicates the location of complete listings of BEST Objectives and Conservation Concepts. Optional "action" activities are included as suggestions to enhance each primary activity. Also, "award" activities are suggested for individual student projects (see "How the Program Works").

Student Newspaper

As a supplement to the activities book, each teacher enrolled in the program will receive classroom quantities of *Notes From Otis*, a conservation education student newspaper. Four different issues of the newspaper will be provided during the school year, approximately every other month. A teacher's edition of the newspaper will accompany each issue for students.

Posters

Periodically, posters will be provided as teaching aids on appropriate resource topics. Also, a "Conservation Challenges" project record chart will be sent to each participating teacher (see "How the Program Works").

How the Program Works

Students receive instruction in eight topical areas through activities in the *Learning With Otis* activities book. Learning is enhanced by periodic use of the student newspaper, *at home* and in the classroom. Students are encouraged to "learn with Otis" by doing teacher-approved projects outside of class for each topic area. Completed projects are recorded for each participating student on the "Conservation Challenge" class record chart. Teachers may order achievement award certificates from the Conservation Department for each student that completes *one project per topic* during the school year.

NOTE: Student project suggestions are listed as "Conservation Challenge Award Activities" at the end of each lesson plan.

However, teachers and students are encouraged to develop their own student project ideas. Also, students can earn points for advancement in the Department's "Conservation Frontiers" Program by completing projects in the "Learning With Otis" Program. ("Frontiers" Program information is available upon request.)

Other Resources

Otis Sketches

A page of Otis sketches is included in the Appendix for developing original spirit masters, bulletin boards, displays, awards, etc.

Material Request Form.

A teacher/youth leader request form is included in the Appendix. The publications listed are for teacher reference and the title generally describes the contents. A new request form will be sent with each material order submitted.

Film Loan Library

The Department of Conservation loans 16mm films to teachers and youth leaders without charge except return postage. A "film source list" may be ordered from the Department and is included on the material request form.

Consultant Assistance

Conservation education consultants are stationed throughout the state to assist you. A map showing consultant districts and headquarters locations is included in the Appendix. If you need assistance, contact the consultant in your area or the Conservation Education Unit, Missouri Department of Conservation, P.O. Box 180, Jefferson City, Missouri 65102.

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CONSERVATION CONCEPTS

The following list of conservation concepts summarizes the practice and definition of conservation addressed by the activities in this booklet.

1. Conservation must involve people, only people can conserve.
2. Conservation is using natural resources so that we will have them to use, now and for future generations.
3. Natural resources are those things taken from nature (renewable and non-renewable) to supply our wants and needs.
4. Renewable resources require space and time for their renewability.
5. Conservation may involve preservation, restoration and management.
6. Management is a conservation tool. Because of demands on all resources, management techniques must be used to extend the availability of nonrenewable resources and to assure the continuous availability of renewable resources.
7. Each resource must be considered separately to best determine the level of wisest use which may range from strict preservation to maximum sustainable use.
8. In the long-term, conservation practices pay off economically.
9. The prosperity and welfare of a nation is dependent upon its resource base. Depletion of the resource base has been an important factor in the decline of many cultures of the past.
10. Resources may be depleted by wasteful use, or increased demand due to increased living standards and/or human population growth.
11. People are subject to the same natural laws that apply to all living things.
12. An understanding of the laws of nature will better enable us to use natural resources intelligently through the application of ecological principles.

MISSOURI BASIC ESSENTIAL SKILLS TEST OBJECTIVES

Reading/Language Arts Objectives

To be assessed by paper-and-pencil test:

1. Identify and interpret terms and directions used on medicine bottles.
2. Identify and interpret the meanings of labels and symbols that caution the reader against specific dangers.
3. Identify and interpret items labeled with consumer vocabulary in selecting their use for a specific purpose.
4. Interpret and indicate the proper response to commonly used signs.
5. Use reference materials and sources to obtain information to solve personal problems.
6. Recognize the main idea and specific details contained in a written selection.
7. Analyze a written selection to note the purpose of the writer, techniques used to convey fact or opinion, possible effects on the reader, and the type of persuasive devices used.
8. Recognize a correctly completed form.
9. Interpret the meaning of business correspondence and simple contracts.
10. Identify and interpret types of information contained in various sections of a newspaper.
11. Interpret the meaning of such commonly encountered documents as menus or ballots.
12. Follow a set of written directions.
13. Interpret information presented in graphic or pictorial manner.

To be assessed locally:

14. Speak and write effectively in different social and business situations and with persons of varied ages or backgrounds.
15. Write with complete sentences, acceptable sentence structure, acceptable grammatical construction, and correct spelling and punctuation.
16. Use reference materials and sources (including human sources) to obtain information to solve personal problems.
17. Recognize the main idea and specific details in an oral presentation.
18. Complete a business form correctly and neatly.
19. Communicate with persons of different age groups and in different situations by reading orally.
20. Recognize and locate parts of the newspaper.
21. Follow oral or written directions to complete a process.

Mathematics Objectives

To be assessed by paper-and-pencil test:

1. Add and subtract whole numbers in sample problems involving real-life situations.
2. Multiply and divide whole numbers in sample problems involving real-life situations.
3. Add and subtract common and decimal fractions in sample problems involving real-life situations.
4. Multiply and divide common and decimal fractions in sample problems involving real-life situations.
5. Solve sample problems involving business and consumer situations.
6. Solve problems involving measures of length, area, and volume.
7. Solve problems involving measures of time and temperatures.
8. Interpret information from charts, graphs, tables, maps, and scale drawings.

9. Solve sample problems by applying the concept of ratio and proportion.
10. Interpret simple probability and statistical statements relating to common situations such as weather reports and opinion polls.
11. Determine the average for given numerical data.
12. Identify horizontal, vertical, parallel, and intersecting lines.
13. Identify simple plane and solid geometric figures.

To be assessed locally:

14. Use standard measuring devices to measure length, area, volume, weight, time, and temperature in common English and metric units.
15. Estimate results and judge the reasonableness of answers to computational problems.

Government/Economic Objectives

To be assessed by paper-and-pencil test:

1. Understand what the term "democracy" refers to and understand basic democratic values, such as liberty, equality, justice, rule of law, peace and order, and consent of the governed.
2. Understand processes of making, enforcing, and interpreting law in the United States.
3. Understand what rights are guaranteed to American citizens.
4. Recognize that in the United States some limits are placed on individual rights and freedoms for the purpose of protecting the interests of society and the rights of other citizens.
5. Understand basic responsibilities of citizenship in our democratic system and how citizens may influence the government.
6. Understand the roles of various government officials, of people who lobby to influence the government, and of people who work within the legal system with whom students may come into contact.
7. Understand basic factors related to the production of goods and services.
8. Understand and be able to apply basic information about how private business functions in the United States.
9. Understand and be able to apply basic information about how the government functions in the United States economy.
10. Predict how one change in the economy will result in other changes.
11. Be able to use rational thought processes when making simple, personal economic decisions.
12. Recognize the rights and responsibilities of consumers.
13. Have basic understanding related to the use and handling of money and to simple personal investments.

THE ADVENTURE OF SLICK, POINTY AND BUMPY

3

ECOLOGY LESSON PLAN #1

BEST OBJECTIVES: #13, 17, 21 (reading/language arts); #8 (mathematics)



OBJECTIVES: After completing the activities, the students should be able to:

1. Find natural objects outdoors that satisfy the requirements found on a simple matrix.
2. Recognize that there is great variety among plants, animals and non-living objects in the environment.
3. Select an appropriate object that fulfills the requirements given in a two-word description (example, black and shiny).

**CONSERVATION
CONCEPTS:** #3

MATERIALS: brown lunch bag or breadsack

**TEACHER RESOURCE
WORDS:**

1. diversity: the variety of living and non-living things in the environment.
2. classification: process by which living and non-living things are placed into groups according to their structural, behavioral and physical characteristics.

PROCEDURE:

1. Read the passage to the class and discuss the adjectives.
2. Explain that the students will be going on an adventure where they will be given two words. They must find an object outdoors that fits that description.
3. Show them how to use the matrix by stating that in square #1 they will need to find a SLICK, GREEN object. Have them give some examples of objects they might find outdoors that would meet these requirements.
4. Have students go outside in pairs with the following equipment: pencil, student page, brown lunch bag. Allow students to actually collect the 12 objects. If they find an object too large to collect they can draw a picture or write the name in the appropriate space. Be sure the students are aware of any restrictions your school may have about collecting attached or unattached objects.
5. After collecting, have the students sort out their objects. One at a time, have each pair hold up an object and have the rest of the class classify the object according to its two characteristics. Have the class discuss what objects were the easiest to find, hardest to find, etc.
6. When the objects have been displayed, let the students make a mobile or collage with their collections.
7. End these activities with a small discussion about the vast variety of objects in nature. Have the students suggest words for another "Adventure Matrix."

ACTION ACTIVITIES:

1. Lead a class discussion on similarities and differences between living things. For example, compare and contrast a fish with a

bird; insect with a dog; bird with a plant.

2. Introduce the concept of how living things have characteristics which make them adaptable to different kinds of environments (such as sharp teeth in predators, talons in birds of prey, webbed feet for frogs and ducks, etc.)

CONSERVATION The students can:

CHALLENGE:

AWARD ACTIVITIES:

1. Cut out pictures of animals, fish and insects from magazines and classify them on a matrix or other format of their choice.
2. Choose two characteristics and find pictures to make a collage of things that meet the requirements.

NAME _____

THE ADVENTURE OF SLICK, POINTY AND BUMPY

If you go outside, you might find things that are
hard,
slimy
rough,
slick.

If you go outside another day, you might find things that are
soft,
dry,
smooth,
bumpy.

Living and non-living things come in many different textures, shapes and colors.

Can you find some things that are
SLICK—like a fast, fast slide?
POINTY—like a needle?
BUMPY—like the skin of an orange?

THE ADVENTURE NATURE HUNT

	GREEN	BROWN	YELLOW	TAN
SLICK	1	2	3	4
POINTY	5	6	7	8
BUMPY	9	10	11	12

LOCKED UP IN CHAINS

3

ECOLOGY LESSON PLAN #2

BEST OBJECTIVES: #12, 13 (reading/language arts)



OBJECTIVES: After completing the activities, the students should be able to:

1. Define and design a food chain.
2. Identify plants as the beginning of all food chains.
3. Trace their food back to the origins in the soil.

**CONSERVATION
CONCEPTS:** #11, 12

MATERIALS: large paper bag; small plastic bag for each pupil; yellow, green and brown sashes; five liters popped corn, kitchen timer, roll of 2.5 cm masking tape

TEACHER RESOURCE WORDS:

1. food chain: a way to describe the flow of energy between organisms. Plants are the beginning of all food chains.
2. food web: many food chains linked together.

PROCEDURE:

1. Ask students how many of them had milk for breakfast.
2. Help them trace the source of milk back to the plants eaten by the cow, and the sun providing energy for the plants to grow.
3. Try tracing other foods to their origins.
4. Have them start with plants and work up to the food they eat (e.g., acorn → turkey → human).
5. Introduce using an arrow (→) to indicate "eaten by."
6. Pass out the worksheet. Have students draw pictures and color each strip a different color. For example, students could color the plant link green.
7. Link the chain together in the appropriate order.
8. Add links or change the food chain by using different plants and animals.
9. Make a mobile by hanging food chains from a large sun or make a sunburst effect by placing chains around a large sun on the bulletin board or wall.

ACTION ACTIVITIES: Play a food chain game:

1. By playing the food chain game, pupils can develop an appreciation for the interdependence of living things in the natural world.
2. Tell pupils that the goal of this game is to survive as an animal in a make-believe food chain by getting enough to eat and avoiding being eaten. (You may want to introduce the words "predator" and "prey.")
3. Each pupil should pull a sash from the large paper bag. Two-thirds of the group will be grasshoppers (yellow sash); one-sixth

will be frogs (green sash); one-sixth will be hawks (brown sash). Give each pupil a plastic bag ("stomach") marked with a piece of masking tape 4 cm from the bottom.

4. Take pupils to a section of lawn measuring at least 15 square meters and designate boundaries. Spread popcorn over the area, saving some for later. Tell the class you are distributing plants that grasshoppers eat.
5. To play the game, grasshoppers put "food" (popcorn) in their "stomachs" (bags). The frogs will try to capture (tag) grasshoppers, and the hawks will try to capture frogs. When a frog captures a grasshopper, the frog adds the grasshopper's popcorn to his/her bag. When the hawk captures a frog, the hawk gets the frog's popcorn. (For ease in playing the game, pretend hawks don't eat grasshoppers.) Set the timer for five minutes and shout "go." After five minutes, ask the class how many animals survived. (For a grasshopper to survive, popcorn must fill its "stomach" to the taped line. Hawks must have the equivalent of one frog and sufficient popcorn to survive.) If at least one of each kind of animal survives, there is an ongoing food chain.

CONSERVATION

CHALLENGE:

AWARD ACTIVITIES:

The students can:

1. Have students see who can make the longest food chain.
2. Have students find out where "molds" (fungi) fit into the food chain and construct a chain which includes a mold.
3. Have the students start a compost jar.

LOCKED UP IN CHAINS

Cut apart on solid lines. Link together to form a chain.

Your
initials

1.	Wheat	
2.	Dove	
3.	Raccoon	
4.	Coyote	
5.	Bacteria	

1.	Smartweed	
2.	Mallard	
3.	Snapping Turtle	
4.	Man	

Now do one of your own.

DECOMPOSITION

3

ECOLOGY LESSON PLAN #3

BEST OBJECTIVES: #12, 15, 21 (reading/language arts)



OBJECTIVES: After completing the activities, the students should be able to:

1. Distinguish between organic and inorganic and give examples of each.
2. Define decomposition.
3. Explain the role of fungi and bacteria in decomposition.

**CONSERVATION
CONCEPTS:** #11, 12

MATERIALS: newspaper, aluminum can, large glass jar, 2-3 tablespoons fertilizer, food materials, leaves, pond or creek water

TEACHER RESOURCE WORDS:

1. decomposition: the process through which organic matter is broken down and returned to the soil.
2. organic: materials that come from living things.
3. inorganic: materials that come from non-living things.

PROCEDURE:

1. Show students a newspaper and an aluminum can. Ask if they have ever recycled these items.
2. Which of these two items was made from something that was once alive? (newspaper) We call materials that are living or come from living things *organic*. Name other organic things in this room. (papers, wooden pencils, lunches, animals, children, etc.) Expand the list beyond the classroom.
3. Explain that metals, glass, and other substances do not come from living things. These, like the aluminum can, are *inorganic*. Have them name other inorganic things.
4. Ask students if they know what happens to leaves after they fall from trees in autumn. (They build up in layers on the ground and gradually rot or decay. Emphasize that the leaves are *recycled* into soil.) Ask them what would happen to the earth if leaves and other living things did not decay. (Wastes would pile up over the earth and organic materials would not be recycled.)
5. Write the word DECOMPOSITION on the board. Divide into syllables and mark for pronunciation. Help students define the word.
6. Bacteria and fungi cannot make their own food. They play an important role in nature because they break down organic material and help recycle the nutrients from dead plants and animals into the soil so it can be used again.
7. Have them complete the worksheet and sing the song on the student page to the tune of "Pop! Goes the Weasel."

- ACTION ACTIVITIES:**
1. Find out where decomposers live by taking a walk to hunt for them. Ask pupils to look for mushrooms and bracket fungi. *Note: Some mushrooms are poisonous.* Instruct pupils to keep their hands and the mushrooms out of their mouths and to wash their hands after handling mushrooms.
 2. Take students in search of or bring a section of a decaying log to class. Using magnifying glasses, look for worms, insects, spiders, eggs and snails. Discuss the role each of these play in the decomposition process.
 3. Make a decomposition jar. Half fill a jar with soil mixed with 2-3 tablespoons of fertilizer. Put food materials (including citrus peelings) into the jar. Ask students to roll leaves between their hands to crumple them; add the leaves to the jar. Mix the contents of the jar, but do not bury all the food material or leaves. Make sure some are against the glass for easy observation. Be sure the mixture is moist, but not wet. Add small amounts of pond or creek water if necessary. Put the lid on the jar tightly and leave it in a dark corner. Have students predict the changes that will take place. Keep a record of what happens in the jar, first on a daily basis and then weekly (up to 4 weeks). Compare what actually happens with what the students predicted.

CONSERVATION The students can:

CHALLENGE: 1. Build a compost pile at home.

- AWARD ACTIVITIES:**
2. Draw a picture of 2 types of fungi (mushrooms or mold).
 3. Make spore prints from mushroom caps. Bring full-grown mushrooms to class. Cut off the stems. Place each cap, gills down, on a piece of paper which will contrast with the spore colors. Cover with a glass or bowl so that it will not be moved. The next day, lift off the glass cover and carefully remove the cap. The lines of the gills will show up clearly in a lovely, rayed pattern. For a more permanent print, spray the paper with hair spray. Hold the spray can far enough from the paper to prevent blowing the spores.

KEY TO PUZZLE:

deer	fish
leaf	rabbit
duck	turkey
owl	spider
mole	frog
pine	ant
mouse	

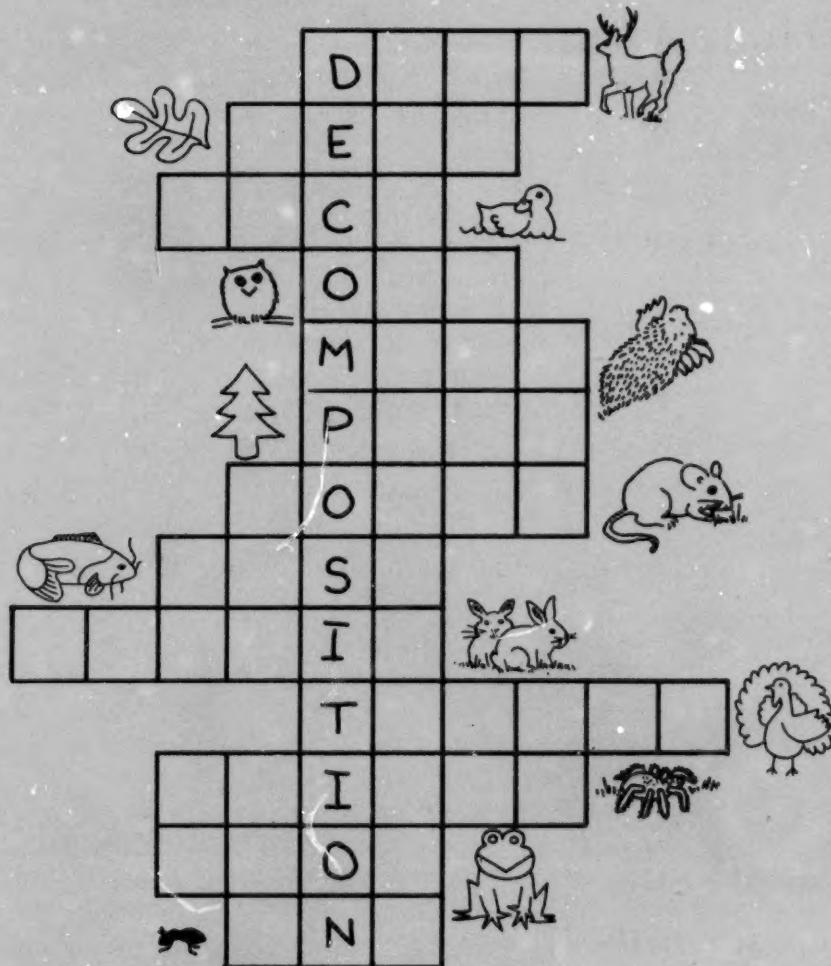
NAME _____

DECOMPOSITION

Sing to the tune of "Pop! Goes the Weasel":

To be a small bacteria mold
Or a mushroom we are wishin'
Then we could do what nature needs most
Decomposition!

Decaying, rotting, breaking it down
Recycling is our mission
That's the way we build the soil
Decomposition!



SUITING UP FOR SNOW

3

ECOLOGY LESSON PLAN #4

BEST OBJECTIVES: #6, 7, 12, 13, 15, 21 (reading/language arts)



OBJECTIVES: After completing the activities, the students should be able to:

1. Define adaptation.
2. Describe how adaptations help organisms to survive.
3. List three animals and their adaptations.
4. Name three animals or plants that are adapted for snow.
5. List three ways people can help wildlife survive the winter.

CONSERVATION

CONCEPTS: #1, 11

TEACHER RESOURCE WORDS:

1. adaptation: a behavior or body part that helps an organism to live in its habitat (e.g., the different shapes of birds' beaks designed for different types of seeds; the different kinds of animal feet such as hooves, paws, claws, webbed feet)

PROCEDURE:

1. Have the class read the passage. Discuss the questions.
2. Discuss the different seasons and how the animals adapt to seasonal changes (fluffing feathers, thicker fur, hibernation, shelter, dormancy, shedding fur).
3. Have the class make a list of adaptations of other animals using the following format:

ANIMAL	BODY PART	PURPOSE
birds	beaks	crack open different seeds, digging for insects.
mammals	feet	some for rock climbing, digging, etc.

4. Discuss how both food and shelter are seasonal factors. (More available in summer.) Why don't we use bird feeders in the summer? (Birds are able to find enough to eat.) How can we help animals in the summer? (provide watering areas and plant food plots for the following winter)
5. Have the class do the activity.
6. Discuss ways to help wildlife survive the winter. (Planting food plots to provide food, bird feeders; building brushpiles)

ACTION ACTIVITIES:

1. Have the students draw other scenes with animals and plants adapted to the environment, such as a summer pond or a grassy field during the spring.
2. As winter approaches, have the students observe their cats or dogs for changes in the fur and their behavior (sleeping, eating). Have the students report on their findings. This can also be done

as spring/summer approaches.

3. Have the students design a new plant or animal that is adapted to the living conditions found within a $\frac{1}{2}$ mile radius (or other reasonable distance) from the school.

CONSERVATION

CHALLENGE:

AWARD ACTIVITIES:

The students can:

1. Find or draw pictures that show ways in which humans adapt to the seasonal changes. (people wearing coats, swimsuits, colors related to seasons; people in swimming pools) Display their pictures in an appropriate manner such as a mobile, poster or bulletin board display.
2. Collect different seeds to see their adaptations and design a display for their collection.

NAME _____

SUITING UP FOR SNOW

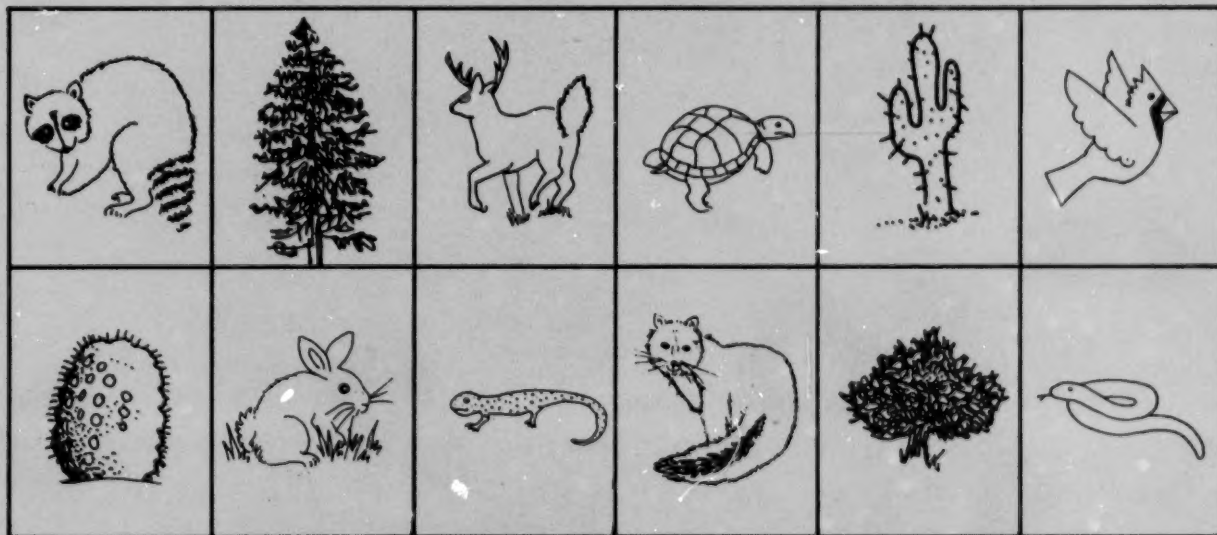
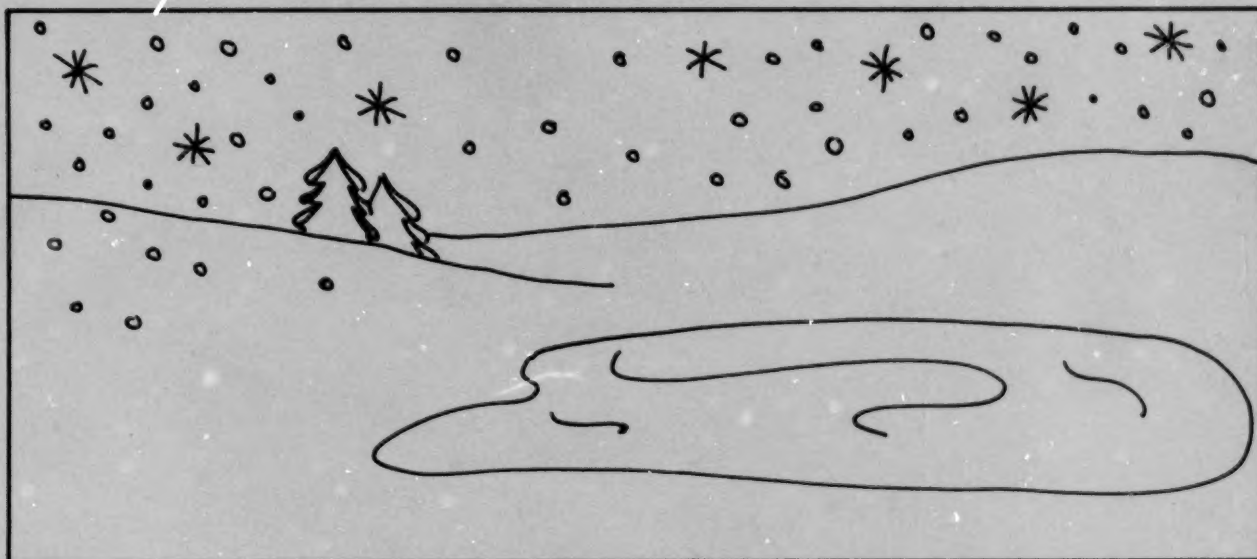
What do you wear in the snow?

Why can't you wear your swimsuit?

How do wild animals make it through the winter?

A raccoon's fur gets thicker during winter. A woodchuck sleeps in a snug den during the winter. Birds move to warmer places or fluff up their feathers to keep out the cold. These changes are called adaptations. They help animals live through the winter.

INSTRUCTIONS: Color and cut out the plants and animals that might live in the snow. Glue them into the winter picture.



THE SEARCH IS ON

3

ECOLOGY LESSON PLAN #5

BEST OBJECTIVES: #13, 17, 21 (reading/language arts); #1, 8 (mathematics)



OBJECTIVES: After completing the activities, the students should be able to:

1. Discuss what is meant by a "predator-prey" relationship.
2. Discuss the possible importance of a search image in catching a prey.
3. Discuss how people are also a part of the predator-prey relationship.

**CONSERVATION
CONCEPTS:** #2, 5, 6, 7, 11, 12

MATERIALS: red, yellow and green toothpicks (several boxes)

TEACHER RESOURCE WORDS:

1. predator: an animal that kills another and eats all or part of that organism.
2. prey: the animal sought after as food by another organism.
3. search image: forming a mental picture of a particular organism or object that is sought after.
4. trial: the number of times you try something; a test or experiment.

PROCEDURE:

1. Ask the students:
 - a. What things do cats like to hunt? (rodents)
 - b. What things do people like to hunt?
 - c. What other animals hunt?
2. The hunters are called predators; the things that they hunt are called prey.
3. Sometimes when animals hunt, a search image is formed. The animals look for prey that smells a certain way, has certain colors and behaves a certain way.
4. People also form search images. When you are hunting for something, you might not see it as well if it is camouflaged. But if the lost object "stands out" among its environment, you would find it faster.
5. Explain to the class that they are going to be toothpick predators. Take them outdoors with their activity sheet and pencils.
6. Place all the toothpicks in a bag and shake well.
7. Have the class turn away from you.
8. Toss the toothpicks onto the ground and say "Go..."
9. The class will have 15 seconds to pick up the toothpicks.
10. Have them record their data.
11. Repeat several times. (Return the toothpicks to the bag after recording.)

12. Summarize the activity by pointing out that predators go after prey that is easily seen and that only after forming a search image will the predators find inconspicuous prey.
13. Using the search image or other means take time to clean the area of all remaining toothpicks.

- ACTION ACTIVITIES:**
1. Have a classroom discussion as to the importance of hunting and fishing in controlling the size of animal populations. Focus on what predators these prey have now as opposed to hundreds of years ago. (Wolves and mountain lions are no longer in Missouri so people have to take their place.) What would happen to deer, turkeys, raccoons, and others if people did not hunt. (The animals would die from other limiting factors such as disease, starvation, exposure to cold and other predators.)
 2. Allow students to repeat the toothpick game, but have them set "hunting regulations" ahead of time as to how many of each color they can retrieve per trial.
 3. Have students discuss the effect of the regulations on the equal opportunity of the hunt.

CONSERVATION The students can:

CHALLENGE: 1. Design their own predator-prey game.

- AWARD ACTIVITIES:**
2. Make a poster of predators matched with their prey.
 3. Design a puzzle that focuses on the predator-prey relationship.

QUIZ KEY: 1. a 2. b 3. b 4. 5. 6.
 7. algae → minnow → bass → eagle
 8. O 9. I 10. O 11. O 12. I 13. O 14. e
 15. thicker fur

NAME _____

THE SEARCH IS ON

DATA SHEET

Number of toothpicks caught	Red	Yellow	Green	Total
Trial 1				
Trial 2				
Trial 3				
Trial 4				
Trial 5				
Trial 6				
Trial 7				
Total				

1. What color toothpicks were the easiest to find?

2. What color toothpick did you pick up the most?

3. What color toothpick did you pick up the most towards the end of the trials?

4. Why was it hard to see some of the colored toothpicks?

5. Were the toothpicks the predators or the prey?

6. Were you a toothpick predator or the prey?

NAME _____

ECOLOGY QUIZ

Put the letter of the adjective in front of the object that it describes best.

DESCRIPTION OF OBJECTS

1. _____ smooth stem of plant
2. _____ thorn of a shrub
3. _____ sharpened pencil
4. _____ toad
5. _____ fish
6. _____ a plowed field

ADJECTIVE

- a. slick
- b. pointy
- c. bumpy

7. Put these living organisms in a food chain:

eagle algae bass minnow

_____ → _____ → _____ → _____

Put an **O** in front of the organic materials. Put an **I** in front of the inorganic materials.

- | | |
|-------------------|-------------------|
| 8 _____ snail | 11 _____ leaves |
| 9 _____ rock | 12 _____ soda can |
| 10 _____ mushroom | 13 _____ feather |

14. Which of the following animals is in a predator-prey pair?

PREDATOR

- a. tuna
- b. quail
- c. rabbit
- d. frog
- e. human

PREY

- cat
- quail's egg
- squirrel
- crow
- deer

15. Tell how the raccoon adapts to the winter.

WEATHER AND WILDLIFE

3

GEOLOGY LESSON PLAN #1

BEST OBJECTIVES: #4, 6, 10, 12, 13, 17, 20, 21 (reading/language arts); 8, 15 (mathematics)



OBJECTIVES: After completing the activities, the students should be able to:

1. Define *forecast*, *meteorologist* and *climate*.
2. State the relationship between climate and weather.
3. State the relationship between climate and the types of plants and animals in an area.
4. Recognize three meteorological symbols.

CONSERVATION CONCEPTS: #12, 13

TEACHER RESOURCE

WORDS:

1. forecast: predict future conditions, usually pertaining to weather.
2. meteorologist: a person who studies or forecasts the weather.
3. meteorological symbols: symbols used to depict weather patterns.
4. climate: average weather conditions in a place over a period of time.

PROCEDURE:

1. Have students cut out the weather report from a newspaper and bring it to class, or write the forecast from a radio or television weather report.
2. Point out that maps are often used when reporting weather conditions. Special symbols are used to express existing conditions. The pattern that is formed can be used to predict future conditions. This is called *forecasting*. People who study and forecast weather are called *meteorologists*.
3. Have students give reasons why people need to know about the weather.
4. Have students compare the reasons farmers, ranchers and people concerned about wildlife need to know about weather with the reasons other people need to know about weather.
5. Point out that the average weather conditions in a place over a period of time is the *climate*. The climate of an area affects the kind of soil and plants which are present, which in turn determine the kinds of animals that can live in the area.
6. Have students complete the activity page.

ACTION ACTIVITIES:

1. Have the class keep track of the daily weather by recording the highs and lows, precipitation and cloud cover onto a large chart posted in the classroom.
2. Have students interview their parents, grandparents and other adults to make a list of weather proverbs. Also have them include proverbs about weather conditions and fishing and hunting.

CONSERVATION The students can:

CHALLENGE:

AWARD ACTIVITIES:

1. Write a report on the importance of weather forecasters to foresters. How might the weather affect a large forest fire?
2. Make a chart that shows the different kinds of animals found in different climates.
3. Design a cover for a book entitled "Weather and Wildlife."

NAME _____

WEATHER AND WILDLIFE

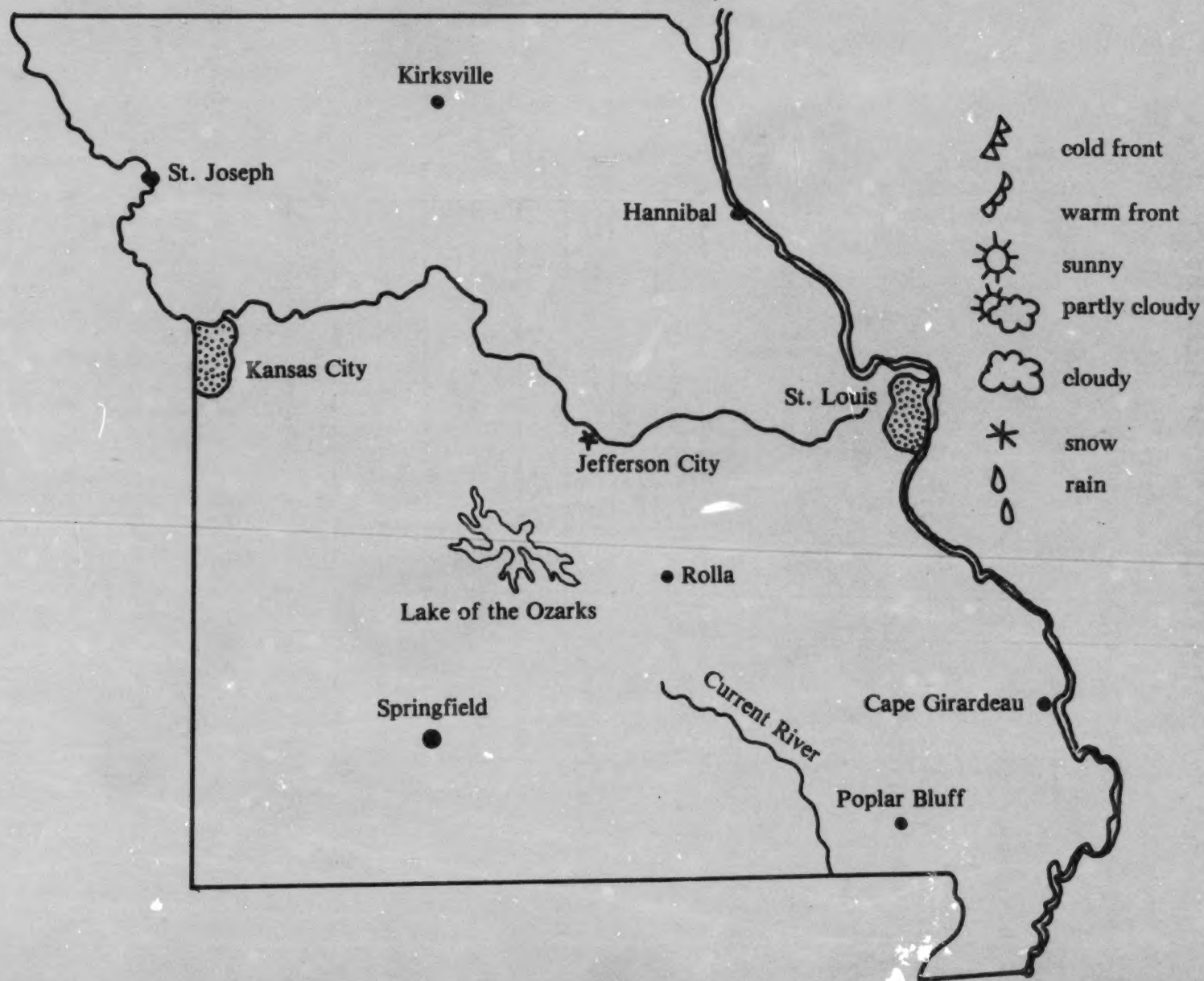
Use the map legend to complete a weather map for Missouri.

1. It is sunny in Kansas City.
2. It is raining over the Lake of the Ozarks.
3. It is partly cloudy in St. Joseph.
4. It is snowing in Hannibal.
5. It is cloudy in Kirksville.
6. There is a cold front from Rolla to the southwest corner of the state.
7. Write these temperatures near the following cities:

Name	Temperature, °F
a. Springfield	34°
b. Kirksville	30°
c. Poplar Bluff	32°
d. Cape Girardeau	36°
e. Rolla	33°
f. St. Louis	31°
g. Kansas City	31°
h. Jefferson City	32°

8. If not shown write the name of your town on the map of Missouri and predict what you think the temperature would be.
9. Write a sentence that tells how people concerned about wildlife would feel after hearing the following forecasts:
 - A. Spring forecast: Very wet. Rainfall way above average. Flooding, high winds and thunderstorms can be expected.
 - B. Summer forecast: Dry, hot, little or no rain for July and August.
 - C. Winter forecast: Heavy snows, high winds. Ice storms may be possible.
10. How do you think a farmer would feel after hearing the forecasts in question #9?

WEATHER AND WILDLIFE



DROUGHT!

3

GEOLOGY LESSON PLAN #2

BEST OBJECTIVES: #6, 7, 17 (reading/language arts)



OBJECTIVES: After completing the activities, the students should be able to:

1. Define *drought* and *stressed*.
2. Give three examples of how weather conditions affect plants.
3. Name two ways drought conditions affect trees.

CONSERVATION

CONCEPTS: #2, 4, 11, 12

TEACHER RESOURCE

- WORDS:**
1. drought (drouth): a long period of dry weather.
 2. stressed: weakened, unable to resist adverse conditions.
 3. humidity: the amount of moisture in the air.

- PROCEDURE:**
1. Have students review ways animals are adapted to varying weather conditions. (See "Ecology Lesson Plan #4.") Point out that while animals can move around or hide to escape weather conditions, plants are unable to do so.
 2. Have students give examples of how weather affects plants. Guide the discussion to include the following circumstances:
 - a. Fruit trees which bloom too early and then freeze produce less or no fruit.
 - b. Severe ice storms cause tree limbs to break.
 - c. Warm weather causes trees and plants to grow.
 - d. Dry weather can stunt plant growth or kill the plant.
 3. Have students complete the activity page.

- ACTION ACITIVITIES:**
1. Observe a cross section of a tree. Notice that the rings formed in dry years are closer together than those formed in wet years.
 2. Have students visit a fire tower and have the towerman or other forester talk to the class about his/her job.

CONSERVATION The students can:

- CHALLENGE:**
1. Write a report on plants which are adapted to dry weather conditions. (cacti, succulents, etc.)
- AWARD ACTIVITIES:**
2. Find out how fruit tree growers protect their trees from weather damage.

ANSWERS TO STUDENT PAGE: 1. b 2. c 3. a 4. c

NAME _____

DROUGHT!

A drought is a long period of dry weather. There is no rain and the air and soil temperatures are high. When a drought happens some people water their gardens and the shrubs and trees around their homes, but it would be impossible to water an entire forest.

When the temperature is above 90°F (32°C) and the humidity is high for several weeks, tree leaves become brown and curled. The tree becomes weakened or stressed. When a tree is stressed, it is unable to get enough water and minerals from the soil to make food and grow normally.

In its weakened state, the tree is open to other problems. Insects eat their way into the wood and tiny molds attack the roots and bark. Sometimes the bark falls off leaving the wood unprotected. Molds are then able to rot the wood and the tree dies. Sometimes trees that are stressed one year may die two or three years later.

The drought causes the tree to become weak and unable to resist damage from insects and molds. Dry weather also makes it easier for forest fires to start so extra care must be taken with picnic and campfires.

Questions: Circle the correct answer.

- | | |
|----------------------------------|-----------------------------|
| 1. This is an example of | 3. <i>Stressed</i> means to |
| a. fiction story | a. become weak |
| b. real story | b. get dressed |
| c. a fairy tale | c. die |
| 2. A drought is | 4. Drought causes a tree to |
| a. a long period of hot weather | a. resist insects |
| b. a long period of cold weather | b. die right away |
| c. a long period of dry weather | c. become weak |

MAKE A ROCK

3

GEOLOGY LESSON PLAN #3

BEST OBJECTIVES: #6, 12, 13, 17, 21 (reading/language arts); #8 (mathematics)



OBJECTIVES: After completing the activities, the students should be able to:
1. Describe how sedimentary rocks are formed in nature.
2. Name two ways sedimentary rocks are used in Missouri.

CONSERVATION

CONCEPTS: #1, 5

MATERIALS: 2 quart jars, soil, samples of sedimentary rocks, 2 small paper or styrofoam cups, pictures of the Grand Canyon and a limestone road cut or river bluff, sand, water, saturated solution of Epsom salt. (Prepare ahead of time by dissolving as much Epsom salt as possible in heated water.)

TEACHER RESOURCE

WORDS:

1. sediment: layer of shells, sand and other materials formed by the weathering of soil and rocks and from the remains of plants and animals.
2. sedimentary rocks: rocks formed when layers of sediments which have settled under water are compacted and cemented together.

PROCEDURE:

1. Show students pictures of the Grand Canyon and a Missouri river bluff or limestone road cut. Have students compare the rocks. (Students should notice the layers of rock in both pictures.)
2. Demonstrate how sediments form in layers.
 - a. Mix soil with water in a quart jar. Pour half of the mixture into a second jar. Set both jars aside until settled.
 - b. Shake the second jar to mix the soil and carefully pour into the first jar so that layers are disturbed as little as possible and set aside.
 - c. Repeat as often as necessary. You may wish to add a layer of shells, buttons, etc., to represent "fossils" among the layers.
 - d. Point out that the water and the top layers press down on the bottom layers. After many millions of years this pressure presses the layers into rock.
3. Discuss and define the terms *sediment* and *sedimentary rocks*. Discuss how sedimentary rocks are formed. (Sediments and dead plants and animals sink to the bottom of the ocean and are covered by more sediments until the weight presses the sediments into rocks. Sometimes chemicals mix with the rocks and have a "cementing" effect.)

4. Remind students that most sedimentary rocks are formed under water. Since Missouri has so many sedimentary rocks, what can be said about the past (geologic) history of Missouri. (It was under water.)
5. Have students complete the activity page.

- ACTION ACTIVITIES:**
1. Have students name ways rocks are used in Missouri. (roads, buildings, bridges, etc.)
 2. Have students locate rock quarries near where they live. (Nearly every county has some kind of crushed stone operation.)

CONSERVATION The students can:

- CHALLENGE:**
1. Design and conduct variations on the "Make a Rock" experiment using different salts or rock materials.
- AWARD ACTIVITIES:**
2. Make a project cube from pictures of buildings, roads, bridges, etc., made out of sedimentary rocks.

- ANSWERS TO STUDENT PAGE:**
- I. Observations will be dependent on rock samples observed.
 - II.
 1. dried out, probably got hard around the edges but easily crumbled
 2. dried out but sand solidly held together like a rock
 3. water, Epsom salt
 4. because the cup with only sand and water did not change
 5. "sandstone," answers will vary

QUIZ KEY: 1. b 2. a 3. c 4. a 5. Sediments sink to the bottom of the oceans and are covered by more sediments until the weight presses the sediments into rocks.

NAME _____

MAKE A ROCK

I. Carefully observe some sedimentary rocks. Place an "X" in the boxes that describe sedimentary rocks.

						other
Light Weight	Black	Crumbly	Sandy	Heavy	Bumpy	
Tan	Gritty	Shiny	Slimy	Coarse	Sparkles	
Fossils	White	Looks Chalky	Smooth	Bright Red	Bands of color	

II. Make-a-rock

1. Write your name on the side of 2 cups.
2. On cup #1, write *sand + water*. On cup #2, write *sand + Epsom salt water*.
3. Fill both cups with sand until they are $\frac{1}{4}$ full.
4. Cover the sand in cup #1.
5. Cover the sand in cup #2 with the Epsom salt water provided by your teacher.
6. Swirl each cup to mix.
7. Set cups in a warm place to dry overnight or several days.
8. Over a piece of newspaper, carefully remove the sand from the cups.

Questions:

1. What happened to the sand in cup #1? _____

2. What happened to the sand in cup #2? _____

3. What could have caused the change(s)? _____

4. How do you know that it was not the water that caused the change? _____

5. What would be a good name for your rock? _____

NAME _____

GEOLOGY QUIZ

1. Meteorologists are people who study:
 - a. meteors
 - b. weather
 - c. the metric system
2. Climate affects:
 - a. the kind of soil and plants that are in an area
 - b. how fast the Earth turns
 - c. the kind of people in an area
3. A long period of dry weather is called:
 - a. summer
 - b. a desert
 - c. a drought
4. When a tree is stressed it cannot:
 - a. resist damage from insects
 - b. grow
 - c. be cut
5. How are sedimentary rocks formed in nature?

SOIL RELATIONSHIPS LESSON PLAN #1

BEST OBJECTIVES: #12, 16 (reading/language arts)



OBJECTIVES: After completing the activities, the students should be able to:

1. Define *weathering*, *expand* and *contract*.
2. Explain how temperature changes contribute to weathering.
3. Define ice wedging and tell how it acts as an agent of weathering.

CONSERVATION CONCEPTS: #12

MATERIALS: small limestone rocks, bunsen burner or hot plate, black construction paper, polystyrene cup

TEACHER RESOURCE

WORDS:

1. weathering: breaking up of rocks by the forces of nature (wind, water, temperature).
2. expand: to get larger.
3. contract: to get smaller.
4. ice wedging: the cracking of rock resulting from water seeping into fractures in the rock, freezing and expanding.

PROCEDURE:

1. Heat a small piece of limestone over a bunsen burner or hot plate. Quickly drop it into a pan of very cold water. What happens to the limestone? (cracks and breaks apart)
2. Define weathering. (process that breaks down a rock)
3. Explain to students that temperature changes contribute to weathering and soil formation. Rocks expand as temperatures rise during the day and contract as temperatures fall at night. Over long periods of time, this expansion and contraction cause rocks to chip. Go outside and search for rocks that have crumbled or cracked. Bring a few samples inside for observation and discussion.
4. Water can also cause weathering. Freezing water expands. If water finds its way into cracks in rocks and then freezes, the expansion will enlarge the cracks and eventually break the rocks into smaller pieces. This is called ice wedging.
5. Have students fill a polystyrene cup half full with water and mark the water level on the outside of the cup with a felt tip marker. Place the cup of water in a freezer. Look at the cup the next day. What happened? (liquid expanded; there appears to be more ice than there was water)
6. During the winter months, have students look for examples of ice wedging in bluffs or in rock cuts along roads.
7. Have students complete the activity page.

- ACTION ACTIVITIES:**
1. Bring some sandstone or limestone rocks to the classroom (or use pieces of brick or concrete). Give each pupil a sheet of black construction paper. Explain that the weathering of rocks can result from moving glaciers grinding rocks. Students can observe this action by rubbing two pieces of rock over the black construction paper. Notice how long it takes to rub off a few fine grains.
 2. Have the students read a book about glaciers and write a report about them. Help students determine if there were ever any glaciers in Missouri.

CONSERVATION The students can:

CHALLENGE:

AWARD ACTIVITIES:

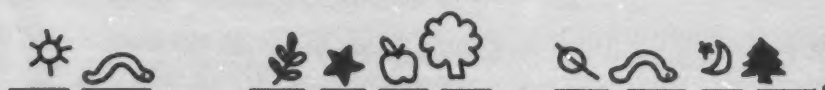
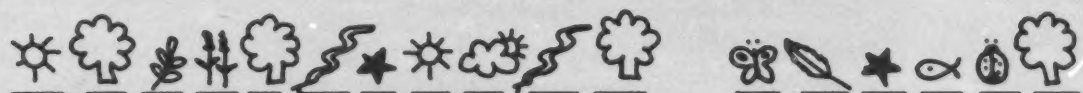
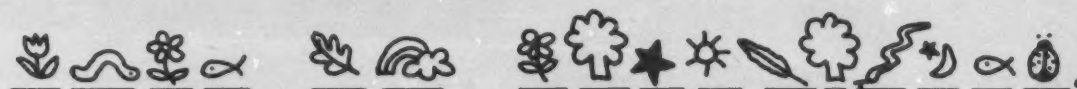
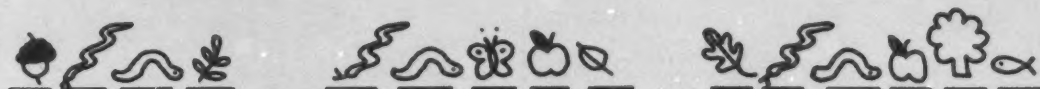
1. Write an explanatory paragraph on why sidewalks are made of squares of concrete rather than in a continuous solid sheet.
2. Make a list of places where they have seen rocks undergoing the weathering process.

ANSWERS TO Soils form slowly from rocks broken down by weathering.
STUDENT PAGE: Temperature change and ice wedging help to make soil.

NAME _____

WEATHERING AWAY

In the coded message below, find out what helps make soil. Write the letter of each picture clue over the same picture in the puzzle.



SOME SOIL SENSE

3

SOIL RELATIONSHIPS LESSON PLAN #2

BEST OBJECTIVES: #13, 17, 21 (reading/language arts)



OBJECTIVES: After completing the activities, the students should be able to:

1. Define *humus* and *loam*.
2. Compare and contrast the appearance and feel of the four soil types.
3. Use a chart to identify the characteristics of the four types of soil.

**CONSERVATION
CONCEPTS:** #1, 12

MATERIALS: labeled containers of sand (A), silt (B), clay (C) and loam (D) for each group (samples available from lawn and garden stores or nurseries); three additional containers for each group; spoons or sticks for mixing soil; water

TEACHER RESOURCE

WORDS:

1. sand: loose particles of crumbled rocks.
2. silt: a kind of soil that does not feel grainy.
3. clay: a kind of soil that can be shaped when wet.
4. humus: decayed plants and animals.
5. loam: soil made from sand, silt, clay and humus.

PROCEDURE:

1. Tell students that soil is formed when tiny particles of rocks are mixed with decayed plant and animal material. (humus) Sand, silt and clay are particles of rock which are found in soil. Sand makes soil feel grainy. Silt particles are flour-like and smaller than sand, and clay particles are the smallest. When sand, silt, clay and humus are mixed together, a type of soil called *loam* is formed.
2. Divide the class into groups of four students and give each group a magnifying glass and one container each of sand (A), silt (B), clay (C) and loam (D).
3. Have students observe each sample. Have them wet part of each sample and see if they can form it into a shape.
4. Have students complete the activity page.
5. Discuss their observations and ask students the following questions:
 - a. Which sample feels like soil? (loam)
 - b. Which sample(s) came from rocks? (sand, silt and clay)
 - c. Which sample has bits of plants or animals in it? (loam)
 - d. Which sample can be shaped when wet? (clay)
6. Have students put equal amounts of loam into three empty containers per group. Have students mix soil types to obtain sandy loam, silt loam and clay loam.

7. Have students feel the soil mixtures. Have them pretend their fingers are plant roots. Which soil mixture do they think would be best for plant roots? Why did they choose this type? Which would be easily moved by wind and water?
8. Mix the loam with water in a jar. Shake the jar, then let settle until soil forms into layers. Identify the layers.

ACTION ACTIVITIES:

1. Have students plant seeds in each soil mixture. Have students make a bar graph of the growth.
2. Have students collect soil samples, from several locations, mix with water and let settle. (Be sure they use equal amounts of soil in identical containers.) Have them measure and compare the size of each soil layer and write a report on their findings.

CONSERVATION

The students can:

CHALLENGE:

AWARD ACTIVITIES:

1. Make a collage of different kinds of soil, either from actual samples, magazine pictures or their own sketches.
2. Plant seeds in a sample of soil from their backyard and chart the growth on a graph.

NAME _____

SOME SOIL SENSE

	How does it: Look?	Feel?	Smell?	Can it be shaped when wet?
A				
B				
C				
D				

Which sample would be best for growing plants? _____ Why do you think so?

45

SOIL RELATIONSHIPS LESSON PLAN #3

BEST OBJECTIVES: #12, 13, 17, 21 (reading/language arts); #8 (mathematics); #7, 10 (government/economics)



OBJECTIVES: After completing the activities, the students should be able to:

1. Sequence several chains involving soil's production of useful materials.
2. Devise two additional chains of useful materials originating from the soil.
3. Prepare a visual display illustrating the importance of soil to people.

CONSERVATION CONCEPTS: #1, 2, 10

TEACHER RESOURCE

WORDS: soil chain: a sequence of products and materials which originate from soil

PROCEDURE:

1. Have students complete the activity page.
2. Discuss the chains in class. Have each student add two more chains involving useful materials.
3. Have students discuss or write a paragraph on "If all the soil was destroyed . . ."

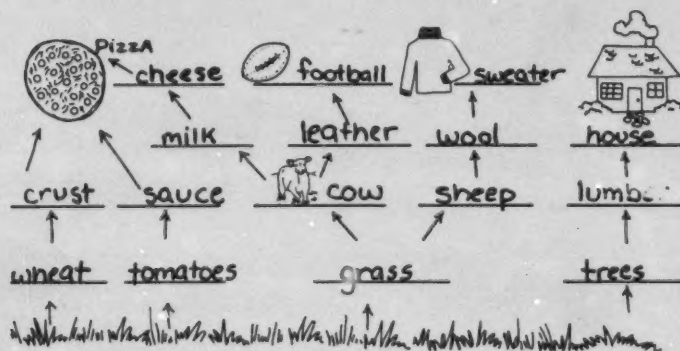
ACTION ACTIVITIES:

1. Have the class give a small presentation to the first graders on the importance of soil. They could give a puppet show, do skits (newscasts, advertisements, etc.)
2. Have students make a list of things in their bedrooms that needed soil at one time.

CONSERVATION The students can:

CHALLENGE: 1. Make a project cube of "soil's gifts to us."
AWARD ACTIVITIES: 2. Compose a song or rhythmic poem that describes several "soil chains." (i.e., the football connected to the leather; the leather connected to the cowhide; the cowhide...

ANSWERS TO STUDENT PAGE:

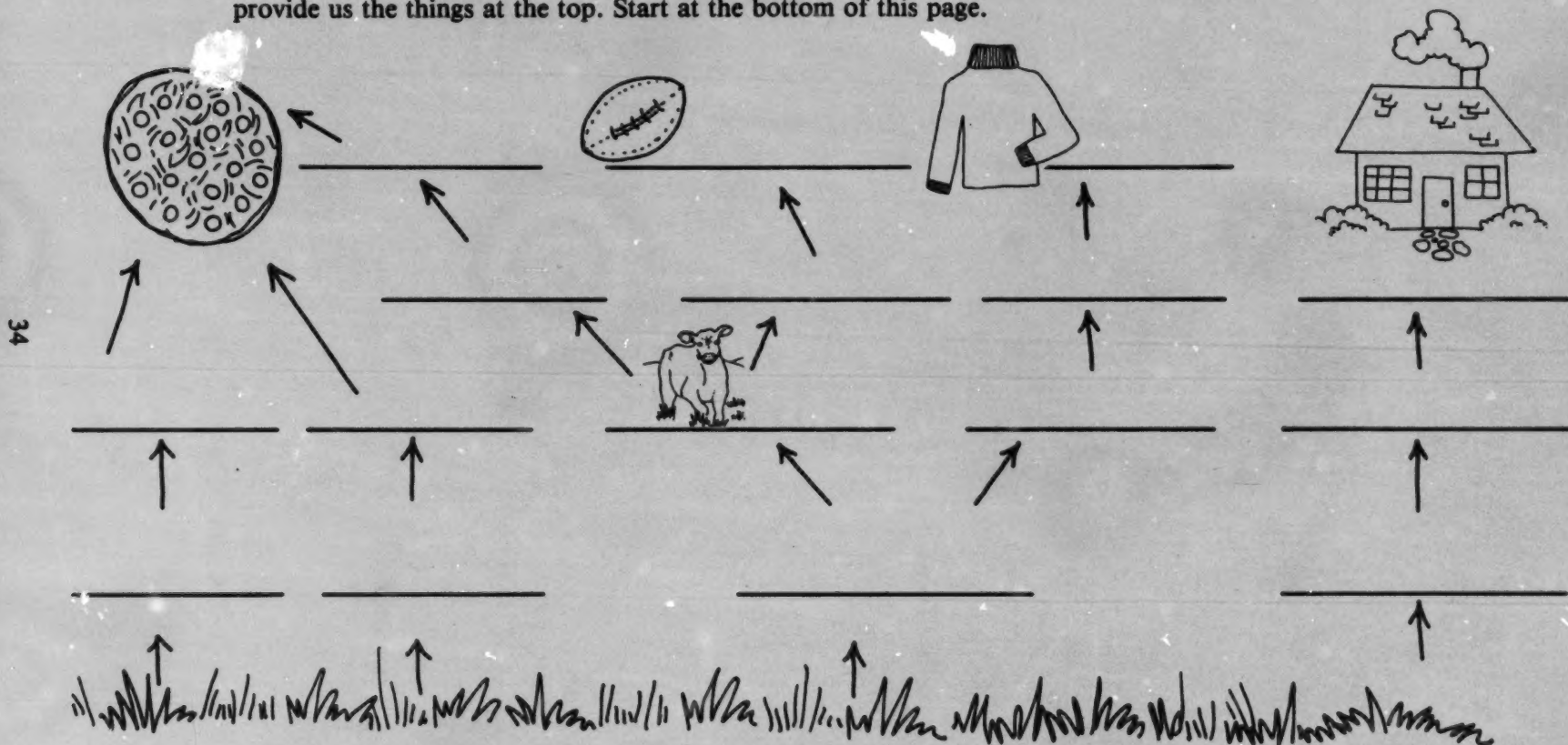


NAME _____

SOIL'S GIFTS TO US

Soil is important to *all* living things. Soil gives us food, clothing, shelter, medicines and things to use when we play games.

Use the words listed at the bottom of the page to fill in the words which complete the process and provide us the things at the top. Start at the bottom of this page.



47

EXAMPLES: lumber crust football sheep leather
 pizza milk cheese house tomatoes
 cow wheat wool grass sweater trees

48

FARMLAND FANTASTIC

3

SOIL RELATIONSHIPS LESSON PLAN #4



BEST OBJECTIVES: #13, 15, 17, 20, 21 (reading/language arts); #7, 10 (government/economics)

OBJECTIVES: After completing the activities, the students should be able to:

1. Name four ways farmers protect soil.
2. Name at least one reason why it is important that farmers participate in good soil management.

CONSERVATION

CONCEPTS: #2, 3, 4, 5, 6, 7, 8, 9, 10

TEACHER RESOURCE

WORDS:

1. contour: around hills rather than up-and-down hills.
2. contour stripcropping: planting crops in narrow strips on the contour.
3. contour farming: plowing, planting, cultivating and harvesting on the contour.
4. terrace: a sloped waterway that follows the contour and prevents water from rapidly running off land.
5. grassed waterways: a broad, shallow waterway covered with grass to prevent erosion and absorb surface water in a field.
6. ground cover: plants which grow close together and prevent soil erosion.

PROCEDURE:

1. Ask students how the words *farmer* and *soil* are related.
2. Have students make a list of how farmers use soil.
3. Have students complete the activity page.
4. Have students discuss the farming practices depicted. Have them tell why good farming practices are important.

ACTION ACTIVITIES:

1. Have students design the front page of a newspaper with the headline "*Farmers Save Soil.*" Have them include a list and description of the techniques used by farmers. Also have them include the effects of farming practices on plants, animals, people, food, clothing, etc.
2. Have the class design their own farms. What buildings, plants, and animals would they include? What soil conservation techniques would they use?

CONSERVATION

The students can:

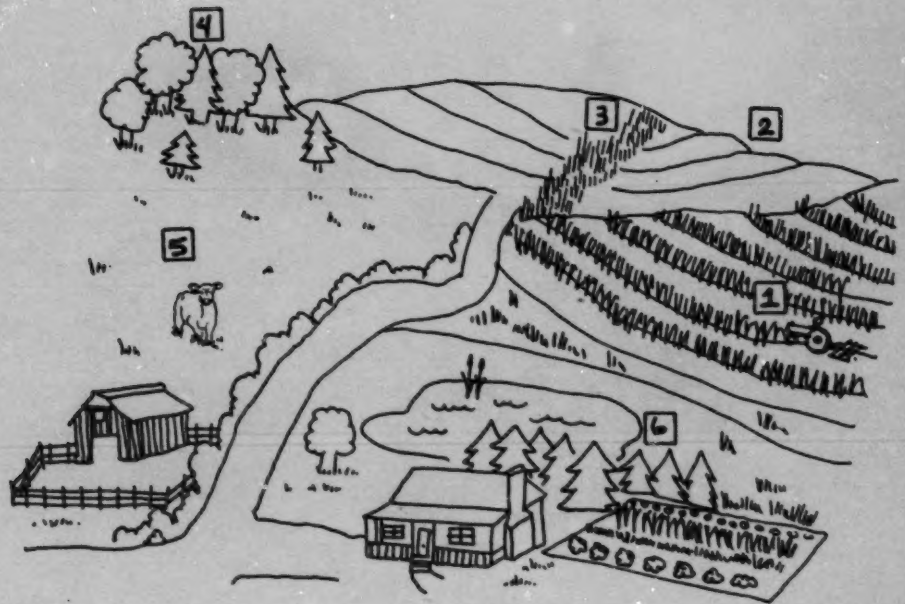
CHALLENGE:

1. Write a letter to one or more area farmers to find out what soil management techniques they use.

AWARD ACTIVITIES:

2. Design a badge or button advocating soil conservation.

**ANSWERS TO
STUDENT PAGE:**



QUIZ KEY: 1. b 2. a 3. a 4. c 5. c 6. b
7. soil, bush, leaves, deer, deerskin, moccasins

NAME _____

FARMLAND FANTASTIC



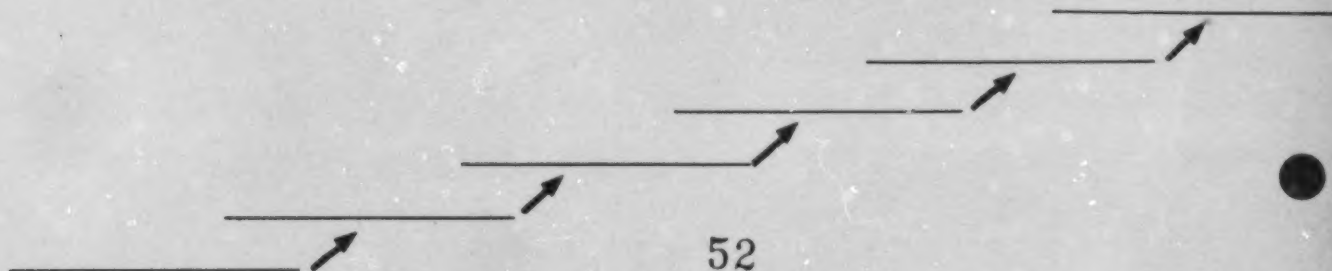
How well farmers use their land will determine their income in the future. They can reduce soil loss by doing several things. Place the number of the soil practice below in the correct box in the picture above.

1. contour plowing: plowing fields and planting crops around the curve of a hill rather than up and down the hill.
2. terracing: making wide ridges that go around a hill to prevent water from rushing down the hill too fast.
3. grassed waterways: planting grasses and not plowing low areas in a field where water usually runs down the hill.
4. forested areas: keeping steep hillsides in trees rather than clearing for cropland.
5. grassy areas: if not overgrazed, pastures on slopes provide ground cover to protect soil.
6. windbreak: rows of trees planted to slow down the wind and prevent soil loss from blowing wind.

NAME _____

SOIL RELATIONSHIPS QUIZ

1. Soils form from rocks broken down by
 - a. fossils
 - b. weathering
 - c. burning
2. When water freezes, it
 - a. expands or gets larger
 - b. contracts or gets smaller
 - c. stays the same size
3. If soil feels grainy it probably has _____ in it.
 - a. sand
 - b. silt
 - c. clay
4. Soil that can be formed into a shape when it is wet probably has _____ in it.
 - a. sand
 - b. silt
 - c. clay
5. Loam is made from
 - a. sand and silt
 - b. clay and humus
 - c. all of the above
6. Wide ridges that go around a hill to prevent water from going down the hill too fast are called
 - a. windbreaks
 - b. terraces
 - c. gullies
7. Make a soil chain using the following words.
bush leaves soil deer deerskin moccasins



LAND USE LESSON PLAN #1

BEST OBJECTIVES: #6, 12, 13, 14, 17, 21 (reading/language arts); #8 (mathematics)



OBJECTIVES: After completing the activities, the students should be able to:

1. List several ways people have abused the land.
2. Discuss how mismanagement of the land affects plants, animals and other natural resources.
3. Design a bumper sticker promoting wise land use decisions.

**CONSERVATION
CONCEPTS:**

#1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12

MATERIALS: Conservation Chart (poster) and text (booklet), scissors

PROCEDURE:

1. Prepare the conservation chart for use according to the directions on p. 3 of the text booklet.
2. Complete the chart according to the directions given. You may wish to pin rather than paste the animals to the chart so it can be reused.
3. After completing the chart, have students design a bumper sticker promoting wise land use decisions.

ACTION ACTIVITIES:

1. Have students sing and act out any of the songs in the Land Use section of *Missouri Conservation Melodies*. (available from your local music teacher or the Missouri Department of Conservation)
2. Have students prepare and perform a "Land Use" program featuring any of the following:
 - a. songs about land use
 - b. riddles/limericks
 - c. skits of people using land long ago and today
 - d. poems, choral readings
 - e. commercials promoting correct land use
 - f. slide show
 - g. photographs

CONSERVATION The students can:

CHALLENGE:

1. Bring in pictures of land that has been misused, and write suggestions for improving it.

AWARD ACTIVITIES:

2. Find examples of good and poor land use in their community and report their findings to the class.

MATCHING HABITATS

3

LAND USE LESSON PLAN #2

BEST OBJECTIVES: #5, 12, 13, 16, 17, 21 (reading/language arts); #8 (mathematics)



- OBJECTIVES:** After completing the activities, the students should be able to:
1. Describe six habitats in their environment.
 2. Identify three plants or animals occurring in each habitat.
 3. List two land uses that harm wildlife.
 4. List two land uses that help wildlife.

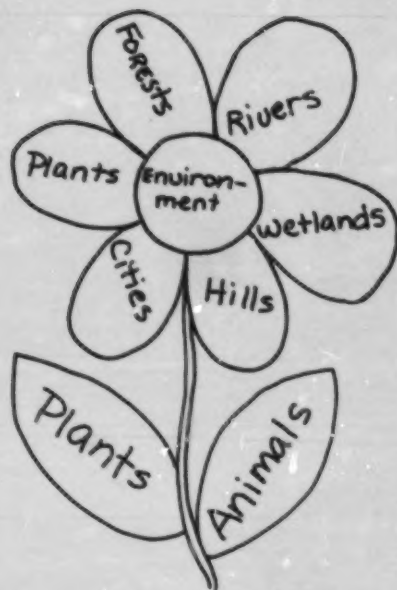
CONSERVATION

CONCEPTS: #1, 5, 6, 8

TEACHER RESOURCE

- WORDS:**
1. **habitat:** the place that has all the things an animal needs to live—food, water, cover.
 2. **environment:** all the conditions, circumstances and influences affecting the development of living things.
 3. **pesticides:** chemicals used to kill insects and weeds.

- PROCEDURE:**
1. Construct a large flower for your bulletin board and label each petal with one of the following habitats: plains, forests, rivers, wetlands, hills, cities. The center of the flower represents the environment and the two large leaves could represent plants and animals.
 2. Have students give oral descriptions of the areas listed, using pictures from the student page if necessary. Discuss the definition of *habitat*.
 3. After completing the activity page, have students list other plants and animals that may be found in these areas. Which organisms are found in more than one habitat?
 4. Why is it an advantage to be able to survive in more than one habitat? (So that if the habitat is destroyed there are still other places to live. Those that are adapted to only one habitat are most susceptible to becoming endangered.)
 5. Have students give examples of instances where people and wildlife conflict with one another. (weeds and destructive insects in crop fields and gardens; birds eating fruits and berries from orchards; rats and mice eating grain; skunks and raccoons carrying rabies; deer eating grain from farm fields, etc.)
 6. Have students give examples of instances where people and wildlife help one another. (owls and snakes eat rats and mice, mice eat weed seeds, etc.)
 7. Name some ways people have used the land which harmed wildlife habitat. (using too much pesticide; building roads, housing subdivisions, and malls; erosion; littering; toxic wastes, etc.)



8. Name some ways people use the land to help wildlife. (planting food plots and windbreaks, establishing wildlife areas, building lakes and ponds, etc.)

- ACTION ACTIVITIES:**
1. Have students identify the habitats near their homes and determine what plants and animals live there.
 2. Name other habitats which are not listed on the activity page (tundra, desert, ocean, mountains, etc.)
 3. Choose one of the habitats and make a mobile showing the plants and animals that live there.

- CONSERVATION CHALLENGE:** The students can:
- AWARD ACTIVITIES:**
1. Build a winter bird feeder and make a list of the types of food that could be placed in it.
 2. Make a project cube depicting different land uses that help wildlife.

**ANSWERS TO
STUDENT PAGE:**

CITIES: flies, mosquitoes, snake, mice, butterfly, tree, ants, moss

PLAINS: flies, pheasant, rabbits, coyote, mosquitoes, blackberry, snake, skunk, turtle, fox, quail, goose, mice, butterfly, ants

FORESTS: flies, bobcat, snake, skunk, turtle, turkey, fox, wood duck, raccoon, deer, mice, butterfly, tree, ants, moss

RIVERS: flies, mosquitoes, snake, turtle, goose, fish, moss

WETLANDS: flies, mosquitoes, snake, skunk, turtle, goose, raccoon, fish, lotus, butterfly, ants, moss

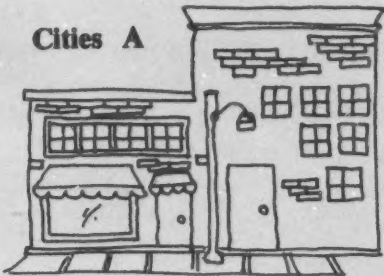
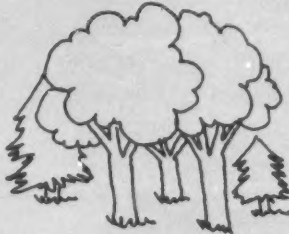
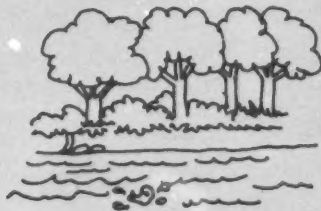
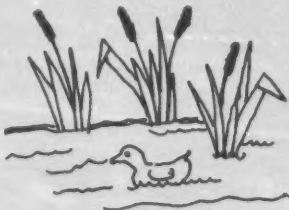
HILLS: flies, rabbit, coyote, mosquitoes, blackberry, bobcat, snake, skunk, turtle, turkey, fox, quail, raccoon, deer, mice, butterfly, tree, ants, moss

- QUIZ KEY:**
1. A place that has all the things an animal needs to live. (food, water, cover)
 2. C
 3. C
 4. M
 5. M
 6. M
 7. C
 8. C
 9. C
 10. C
 11. M
 12. turtle, duck, frog, mosquito, cattail, crayfish

NAME _____

MATCHING HABITATS

Put the letter(s) of each habitat in the box of the animal or plant found there. Some animals are found in more than one habitat.

Flies	Pheasant	Rabbit	Coyote	Mosquitoes	Blackberry
Moss	Cities A  Plains B 				Bobcat
Ants					Snake
Tree	Forests C  Rivers D 				Skunk
Butterfly					Turtle
Mice	Wetlands E  Hills F 				Turkey
American lotus					Fox
Deer	Fish	Raccoon	Wood duck	Canada goose	Quail

NAME _____

LAND USE QUIZ

1. What is a habitat?

Put a "C" if it is in Clear River Valley and an "M" if it is in Muddy River Valley.

- | | |
|---------------------------|-------------------------------|
| 2. _____ lots of wildlife | 3. _____ trout fishing |
| 4. _____ muddy water | 5. _____ gullies |
| 6. _____ pollution | 7. _____ fire tower |
| 8. _____ sewage treatment | 9. _____ good crops |
| 10. _____ forests | 11. _____ topsoil washed away |

12. Circle the ones that live in a wetland habitat.

quail turtle fox duck frog
pheasant mosquito turkey cattail crayfish

UGLY, UGLY LITTER

3

CONSERVATION ETHICS LESSON PLAN #1

BEST OBJECTIVES: #12, 13, 14, 15, 17, 21 (reading/language arts); #6, 8 (mathematics)



OBJECTIVES: After completing the activities, the students should be able to:

1. Construct a map of their school grounds and mark places where litter is found.
2. Propose the source of the litter.
3. Describe how litter affects the beauty of the landscape.
4. Record data on litter collected from the schoolyard.
5. Name two ways to reduce the amount of litter.

CONSERVATION CONCEPTS: #1, 2, 10, 12, 13

MATERIALS: rulers, pencils

TEACHER RESOURCE

WORDS:

1. trash: worn out, useless things.
2. litter: trash that is scattered carelessly.

PROCEDURE:

1. Discuss the meaning of *trash* and *litter*.
2. Have students work in pairs. Distribute the data sheets and answer any questions about how to complete it.
3. Have students complete Part I of the activity page.
4. Bring all litter to a central work area and complete parts II and III A.
5. After parts II and III A are completed, have students return to the classroom and complete part III B. Focus a discussion on how the litter got on the schoolyard; who put it there? Why was it put there? What types of litter were seen? How does litter affect the landscape?
6. Have students propose ways that litter could be reduced around the schoolyard.
7. Have students decide which items can be recycled (paper, aluminum and glass) and which cannot. (plastics)

ACTION ACTIVITIES:

1. Have the class set up a 'mini' recycling center for paper, glass and aluminum cans.
2. Have the students give oral editorials about why litter should be eliminated.

CONSERVATION CHALLENGE: The students can:

AWARD ACTIVITIES:

1. Design anti-litter posters, bumper stickers or signs to post around the school.
2. Write a poem about littering.
3. Make a litter map of their own neighborhood.

NAME _____

UGLY, UGLY LITTER

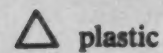
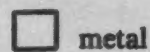
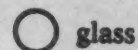
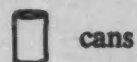
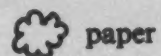
Part I. Draw a map of your schoolyard.

Mark down the places you find litter.

Use the following symbols to identify the litter found.

Add new symbols if necessary.

LEGEND:



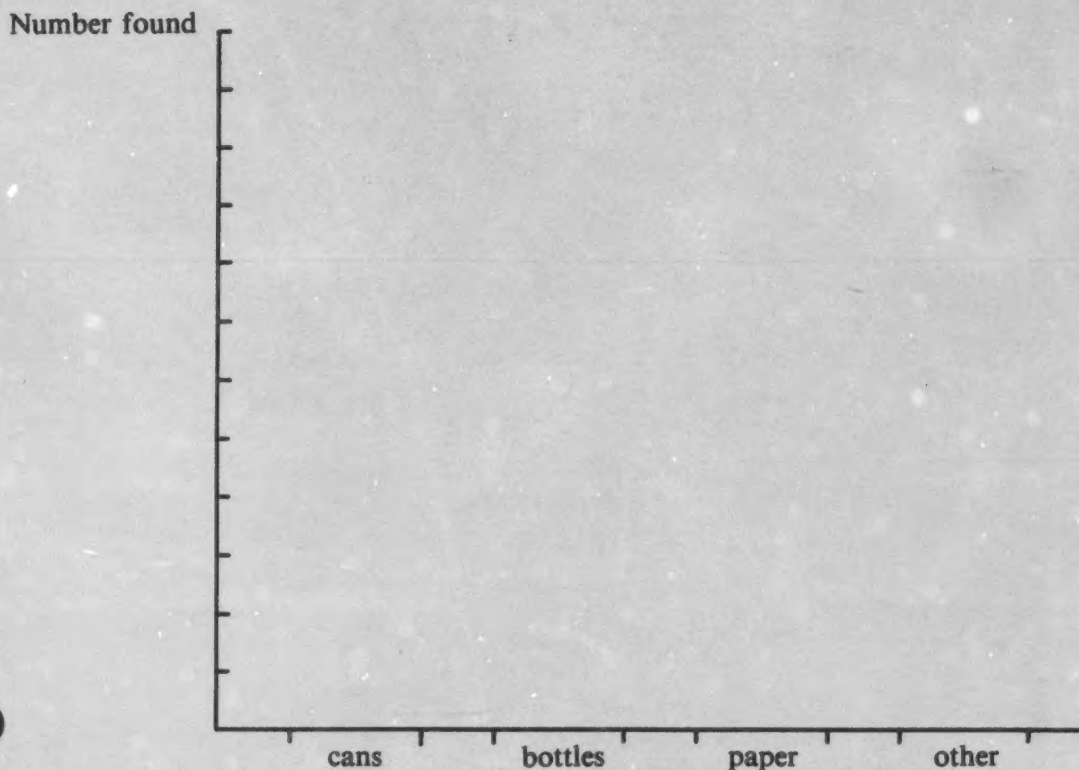
Part II. Measure the following things you find:

- a. longest piece of litter: _____
- b. shortest piece of litter: _____
- c. widest piece of litter: _____
- d. heaviest piece of litter (estimate): _____

Part III. A. Fill in the chart. Then place all litter in trash cans.

Litter	Cans	Bottles	Paper	Other kinds
Number found . . .				
Type/ description				

B. Make a bar graph using the numbers above.



CONSERVATION ETHICS LESSON PLAN #2

BEST OBJECTIVES: #12, 17 (reading/language arts); #4 (government/economics)

OBJECTIVES: After completing the activities, the students should be able to:

1. State why we have rules and laws.
2. Tell why we have hunting, fishing and trapping rules.
3. Recognize the consequences of breaking a law.

CONSERVATION

CONCEPTS: #1, 5

TEACHER RESOURCE

WORDS: law: a rule everyone must follow.

- PROCEDURE:**
1. Have students name reasons why we have laws. (to protect individual freedoms)
 2. What rights and privileges do students have? (right to an education, maybe to work in small groups or on their own, equal opportunity on the playground, etc.)
 3. Ask students what duties and responsibilities they must follow in order to achieve or maintain these privileges. (obey school rules, keep noise to a minimum when working in small groups, share playground equipment, etc.)
 4. Why do we have rules governing hunting, fishing, and trapping? (to prevent over-harvesting and to give all legal sportsmen the same opportunity for a successful harvest)
 5. Who enforces these wildlife rules? (conservation agent or peace officer)
 6. Have students state what happens when we break a law. (must pay a fine, go to jail, other suitable punishment)
 7. What happens to money collected from fines for breaking wildlife laws? (goes to schools in the county where the violation occurs)
 8. Have students complete the activity page.

- ACTION ACTIVITIES:**
1. Obtain a copy of *WILDLIFE CODE OF MISSOURI* from Missouri Department of Conservation or a local store that sells hunting and fishing licenses. Find out at what age children need to obtain hunting, fishing, and trapping permits. Also, find out the rules on keeping wild animals as pets.
 2. Make a list of rules at school, rules at home. Have students cite reasons for these rules.
 3. Have a conservation agent speak to the class on the necessity of wildlife codes. Have him/her introduce the SPORT (Sportsmen Protecting Our Resources Together) Program. Make sure students have prepared a few questions to ask the agent.

- CONSERVATION** The students can:
- CHALLENGE:** 1. Have students make a list of things they can do to conserve wildlife.
- AWARD ACTIVITIES:** 2. Write a letter to a friend telling why it is important to follow all wildlife laws.

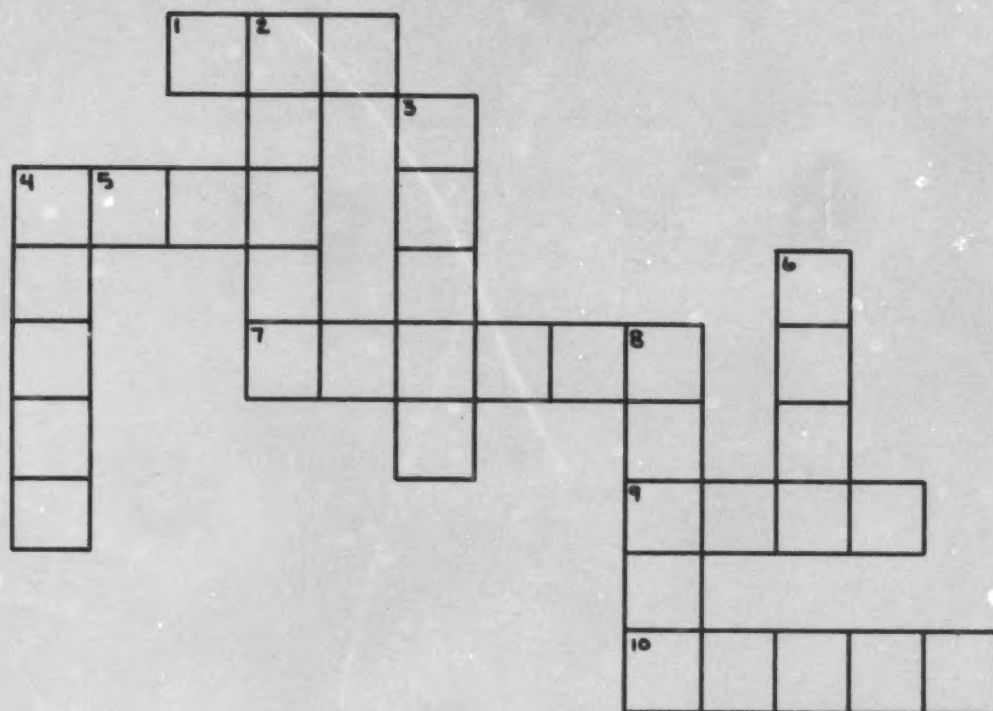
ANSWERS TO

STUDENT PAGE: Across: 1. law, 4. crime, 7. thanks, 9. obey, 10. think

Down: 2. agent, 3. clean, 5. right, 6. fine, 8. SPORT

NAME _____

LAWS TO LIVE BY



SPORT
CRIME
THINK
OBEY
LAW
THANKS
CLEAN
RIGHT
AGENT
FINE

ACROSS

1. A rule everyone must follow.
4. Breaking a law.
7. What you should say when a landowner lets you use his land.
9. Follow a rule.
10. Use your mind.

DOWN

2. Someone who enforces conservation rules.
3. Not dirty; pure.
5. You do the _____ thing when you obey the law.
6. A punishment for a crime.
8. Stands for "Sportsmen Protecting Our Resources Together."

USING OUR RESOURCES

3

CONSERVATION ETHICS LESSON PLAN #3

BEST OBJECTIVES: #12, 13, 17 (reading/language arts)



- OBJECTIVES:** After completing the activities, the students should be able to:
1. Name four natural resources that brought people to Missouri.
 2. Name three resources used in the present.
 3. Describe ways people have misused resources.
 4. Discuss ways to conserve natural resources.

**CONSERVATION
CONCEPTS:** #5, 10

TEACHER RESOURCE

- WORDS:**
1. natural resources: things we take from nature to supply our wants and needs.
 2. conservation: wise use of natural resources so we can use them now and in the future.

- PROCEDURE:**
1. Have students define and give examples of natural resources. (things we take from nature to supply our wants and needs; fish, forests, wildlife, soil, air, water, minerals)
 2. What natural resources brought early explorers to Missouri? (wildlife for fur and food, trees for timber, soil for farming, minerals for mining) Because of these resources, how was most of the land used during the time of the pioneers? (farming, hunting, trapping, timber cutting and some mining)
 3. and cities. (parks, highways, schools, homes, stores, industries, roads, airports, etc.) What resources support these land uses? (minerals, plants, fuels, etc.)
 4. Discuss with students that natural resource use has changed over the years. As our population grew, we had to use more resources in different ways. Sometimes people didn't use the resources wisely.
 5. As our population increased, what happened to homes (habitat) for wildlife? (destroyed to make room for people) Discuss other ways that people have wasted or abused resources. (cut too many trees without replacing them, polluted water, allowed erosion to occur, dumped toxic wastes and poisons on the land, air pollution, acid rain, over-harvest of wildlife, etc.)
 6. Have students tell how we might use resources in the future when there are even more people than there are now. Where will all the people live? What will they eat?
 7. Have students suggest ways to conserve natural resources.
 8. Have students complete the activity page.

ACTION ACTIVITIES:

1. Invite a local historian to visit the class and talk about how the area has changed over the years. Who were the first settlers? What was the first town?
2. Have students ask grandparents or others what their town was like 50-100 years ago. Then have students perform a skit depicting the early history of their town.

1. Invite a local historian to visit the class and talk about how the area has changed over the years. Who were the first settlers? What was the first town?
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CONSERVATION The students can:

The students can:

CHALLENGE: 1. Draw a picture of how the school area looked in the past, how it looks now, and how it may look in the future.

AWARD ACTIVITIES: 2. Make a list of products that were not available 20 years ago and tell what natural resources are used to make and run them.

1. Draw a picture of how the school area looked in the past, how it looks now, and how it may look in the future.
2. Make a list of products that were not available 20 years ago and tell what natural resources are used to make and run them.

ANSWERS TO STUDENT PAGE:

N A C O N S E R V A T I O N
T U S L A R E N I M R A O L
R E S W A T E R O U Z I C
E S A W N A T S O I T L W
R A N D M A F O R E U S T S P
U F T O I N W I L D L I F E O
R F S I S S O I L I T L U I L L
I S C H S O N S E R O V S A S
M N O F O R E S T S P I H T D
I N E R U A L S M I S S O U E R
N A T U R A L R E S O U R C E S
Z E D A I R G D R V I H T Y N X
F U R O
W E L C

N A C O N S E R V A T I O N
 T U S L A R E N I M R A O L
 R E S W A T E R O U Z I C
 E S A W N A T S O I T L W
 R A N D M A F O R E U S T S P
 U F T O I N W I L D L I F E O
 R F S N S O I L I T L U I L L
 I S C H S O N S E R O V S A S
 M N O F O R E S T S P I H T D
 I N E R U A L S M I S S O U E R
 N A T U R A L R E S O U R C E S
 Z E D A I R G D R V I H T Y N X
 F U R O
 W E L C

QUIZ KEY: 1. wildlife, trees, water, minerals 2. crime
3. Paper, aluminum, glass 4. E 5. C
6. D 7. B 8. A

1. wildlife, trees, water, minerals 2. crime
3. Paper, aluminum, glass 4. E 5. C
6. D 7. B 8. A

NAME _____

USING OUR RESOURCES

Find these hidden words:

Missouri
natural resources
fur
minerals
soil
air
water

wildlife
fish
forests
conservation
pollution
wants
needs

N A C O N S E R V A T I O N
T U S L A R E N I M R A O L
R E S W A T E R O U Z I C
E S A W N A T S O I T L W
R A N D M A F O R E U S T S P
U F T O I N W I L D L I F E O E
R F S N S O I L I T L U I L L
I S C H S O N S E R O V S A S
M N O F O R E S T S P I H T D
I N E R U A L S M I S S O U E R
N A T U R A L R E S O U R C E S
Z E D A I R G D R V I H T Y N X
F U R O
W E L C

NAME _____

CONSERVATION ETHICS QUIZ

Fill in the blanks. Use these words.

crime	wildlife	trees	water
paper	aluminum	grass	minerals

1. Early explorers came to Missouri to find _____, _____
_____ and _____.
2. When we don't obey the law we commit a _____.
3. _____, _____ and _____ should be recycled.

Match the definition.

- | | |
|---|----------------------|
| 4. _____ worn out useless things | A. conservation |
| 5. _____ trash that is scattered carelessly | B. law |
| 6. _____ things we take from nature to supply our wants and needs | C. litter |
| 7. _____ a rule everyone must follow | D. natural resources |
| 8. _____ wise use of natural resources | E. trash |

BEAKS FOR BIRDS

3

WILDLIFE LESSON PLAN #1

BEST OBJECTIVES: #12, 13, 14, 15, 17 (reading/language arts); #8 (mathematics)

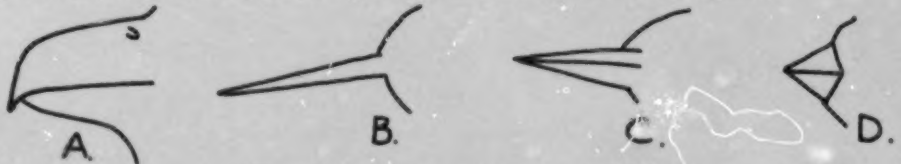


- OBJECTIVES:** After completing the activities, the students should be able to:
1. Recognize that animal eating habits can be learned by studying mouth parts.
 2. Match common beak shapes with the types of foods eaten by birds.
 3. Give at least one reason for studying the feeding habits of animals.

CONSERVATION CONCEPTS: #1, 5, 12

MATERIALS: pictures of a hawk, eagle or owl; finch, sparrow or cardinal; hummingbird; woodpecker

PROCEDURE: 1. Draw the following birds' beaks on the chalkboard.



2. Have students identify the pictures and tell what a bird's mouth is called. (beak or bill) Ask the following questions.
 - a. Which beak would be best for sucking juice from deep inside a flower? (B) Why? (long, could work like a straw)
 - b. Can you think of a bird with this type of beak? (hummingbird) Place the picture below beak B on the chalkboard.
 - c. What beak would be best for tearing meat from a fish? (A) Why? (sharp, curved for ripping, strong)
 - d. Can you name a bird with this kind of beak? (hawk, eagle, owl) Place the picture below beak A.
 - e. What beak would work best for poking holes in a tree to search for insects? (C) Why not one of the others? (A is curved; B is too long and narrow, might break; D is too short)
 - f. Name a bird with this kind of beak. (woodpecker) Place the picture below beak C.
 - g. Which beak is left? (D) What kind of food might be eaten with this beak? (nuts and seeds that need to be cracked open) How can you tell? (short, strong)
3. Have students name some of the birds that visit feeders in the winter. (cardinals, blue jays, sparrows, juncos, finches, etc.) Ask what kinds of food these birds eat. (seeds) Which drawing are they most like? (D) Place a picture below beak D.

4. Explain that by studying the mouth parts of birds and other animals, we can learn something about the kinds of food that they eat. Ask students why it is important to know what an animal eats. (If we know what kinds of foods they eat, we can help provide these foods. For instance, if we find that an animal prefers grass seeds, we can plant those grasses to help that kind of animal.)
5. Have students complete the activity page.

ACTION ACTIVITIES:

1. Sing a song about a particular bird and then find out as much as possible about that bird. (where it nests, what it eats, what it looks like, what it sounds like)
2. Bring some wild bird seed to class and give a small amount to each student. Help the students identify each kind of seed, showing them pictures of the kinds of plants the seeds come from. (or the kinds of plants the seeds grow into) Wild bird seed usually contains sunflower seeds, millet, niger, and corn. Have students find pictures of birds that eat these seeds.

CONSERVATION

The students can:

CHALLENGE:

AWARD ACTIVITIES:

1. Build a bird feeder and place it outside during the winter, taking care to keep it well stocked.
2. Plant a birdseed garden in the spring and harvest the seeds in the fall.
3. Paste a picture of a Missouri bird in the middle of a poster board or sheet of construction paper. Find out what kinds of food the bird eats and paste or draw pictures of these foods around the bird.
4. Draw a hummingbird feeding from a hummingbird feeder. Color the drawing and find a recipe for the food used in this kind of feeder.

ANSWERS TO

STUDENT PAGE:

robin—earthworm owl—mouse woodpecker—beetles
and other
insects

cardinal—sunflower seeds hummingbird—tubular flower

duck—water plants

NAME _____

BEAKS FOR BIRDS

Match each bird with the kind of food it is most likely to eat. Color the drawings with the proper colors.

Choose one of the birds and its food. Write three sentences about it on the lines below.



A CHAIN OF EVENTS

3

WILDLIFE LESSON PLAN #2

BEST OBJECTIVES: #5, 8, 13, 15, 16, 17, 19 (reading/language arts)



OBJECTIVES: After completing the activities, the students should be able to:

1. Define and give an example of a *food chain*.
2. Give examples of predator and prey animals.
3. State what might happen when a link in a food chain is broken.
4. Briefly explain what is meant by wildlife management.
5. Describe one or more ways that people can help wild animals.

CONSERVATION CONCEPTS: #1, 2, 3, 5, 6, 10, 11, 12

TEACHER RESOURCE

WORDS:

1. food chain: a series of transfers of food (energy) from one organism to another.
2. predator: an animal that captures and feeds on other animals.
3. prey: an animal that is captured and fed upon by another animal.
4. scavenger: animal that feeds on dead bodies of other animals.
5. wildlife management: changing the environment to provide for the welfare of wildlife.
6. conservationist: one who practices and promotes the wise use of natural resources.

PROCEDURE:

1. Ask students the following questions:
 - a. How many of you like ham?
 - b. From what animal do we get ham? (pigs)
 - c. What do pigs eat? (grain, other plant materials)
 - d. Where does grain come from? (plants)
 - e. Where do plants grow? (soil, ground)
2. Draw a large chain with three links on the chalkboard such that there is enough space within each link to write words (or attach pictures/drawings). Ask students the following questions:
 - a. What kind of wildlife food is produced by oak trees? (acorns)
 - b. What large Missouri birds eat acorns? (wild turkeys)
 - c. What animals may capture and eat a wild turkey? (fox, coyote, people) Write the students' choice in the third link.
3. Introduce the words *predator* and *prey*. Write the words beneath the appropriate links in the chain. (See Ecology Lesson Plans #2 and #5.) Have students write other predator—prey pairs on the chalkboard.

4. Tell students that both the pig and wild turkey stories are examples of a food chain. Have students write the "pig" food chain on the chalkboard. Have another student write a "water" food chain. (e.g., small aquatic plants and animals → bluegills → bass → people)
5. Return to the food chain involving the wild turkey. Ask what might cause wild turkeys to disappear. (not enough acorns and other food, too many killed by predators, destruction of habitat)
6. Ask students what would happen to the predators if all or most of the wild turkeys disappeared. (they would have to find other kinds of animals to capture and eat; they might suffer from lack of food; might move to another area where food is more abundant)
7. Tell students that conservationists try to make sure that there will be enough food for wildlife and that no animal becomes too abundant for its food supply. This is a part of what is called *wildlife management*.
8. Have students tell how people can help wildlife. (obey wildlife regulations which help keep the numbers of wild animals from becoming too low, take care of forests and fields which provide food and cover, protect and provide sources of water, etc.)
9. Have students complete the activity page.

ACTION ACTIVITIES:

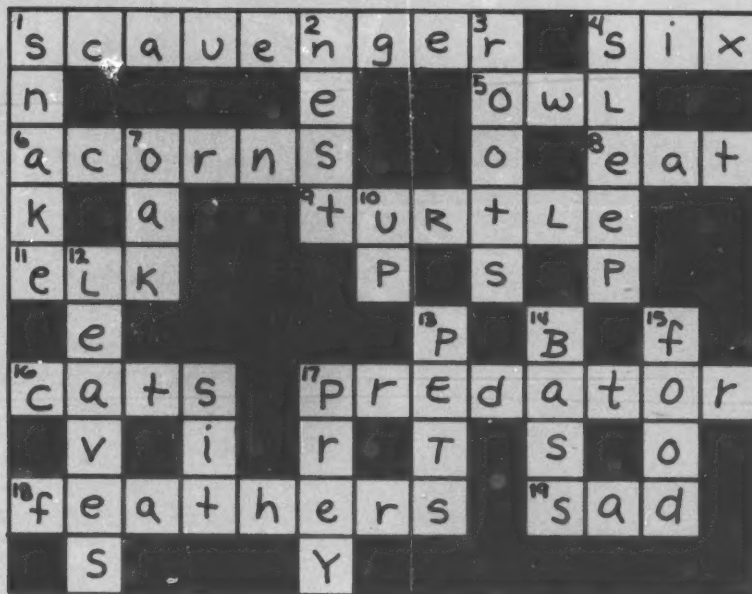
1. Help students define and give examples of animals which are scavengers. (crows, turkey vultures, opossums) Other animals such as eagles, coyotes, red-tailed hawks will also eat dead animals which they have not killed. Have students discuss the role of scavengers in a food chain.
2. Divide the class into five or six teams and assign each team the name of a wild animal found in Missouri. Have each team write five clues about their animal. (size, color, where found, kinds of food eaten, body covering, etc.). Have one team read their clues one at a time, starting with the hardest clue. After each clue, have the other teams guess the name of the animal and write it on a piece of paper and give it to the teacher. Continue this process until one or more teams have correctly guessed the name of the animal. Repeat game for each team.

CONSERVATION CHALLENGE: AWARD ACTIVITIES:

The students can:

1. Draw a picture of a Missouri predator feeding on its prey. Color, name each animal, and label which one is the predator and which one is the prey.
2. Write a paragraph that begins with "Scavengers are very important . . ."

**ANSWERS TO
STUDENT PAGE:**

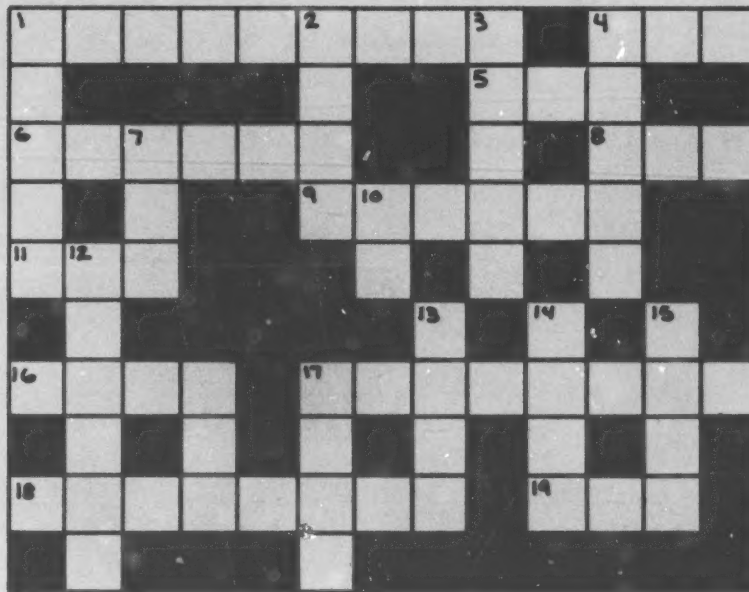


NAME _____

A CHAIN OF EVENTS

Use these words:

snake cats leaves sit turtle six eat acorns predator bass nest
food pets roots owl sleep oak up sad feathers prey



ACROSS

1. Animal that feeds on dead bodies of animals which they did not kill.
4. Number of legs an insect has.
5. Animal that does give a hoot.
6. Nuts produced by oak trees and eaten by deer, turkeys, and squirrels.
8. What animals do with their mouths.
9. Reptile that carries its home on its back.
11. Large deer-like animal that once lived in Missouri.
16. House pets related to mountain lions.
17. What we call an animal that captures and eats another animal.
18. Outer covering of birds.
19. What we would be if there were no animals in Missouri.

DOWN

1. Reptile without legs.
2. Birds lay eggs in this.
3. Part of tree below ground.
4. What people and some animals do at night.
7. Type of tree that produces acorns.
10. Opposite of down.
12. The green parts of a tree that make food for the tree.
13. Dogs and cats make good _____ but wild animals do not.
14. Type of fish that eats bluegills and rhymes with *pass*.
15. Something animals and people must have to live.
17. What we call an animal that is captured and eaten by another animal.

WE NEED WILDLIFE

3

WILDLIFE LESSON PLAN #3

BEST OBJECTIVES: #3, 5, 13, 16, 17 (reading/language arts); #1, 5, 8 (mathematics); #7, 8, 10, 11, 13 (government/economics)



OBJECTIVES: After completing the activities, the students should be able to:

1. Define *recreation*, *business*, *products* and *habitat*.
2. Give examples of how wild animals are important to people in terms of recreation, business and products.
3. Predict the effect of a loss of wildlife habitat on the recreation, business and products associated with wildlife.

CONSERVATION CONCEPTS: #1, 2, 3, 8, 10, 12

TEACHER RESOURCE

WORDS:

1. recreation: games, sports or other activities we enjoy.
2. business: stores and offices which provide goods and services.
3. products: things made by people from natural resources.
4. habitat: the place where an animal lives, providing food, water and cover.
5. cover: the physical part of an animal's habitat that provides protection from predators and the elements. (brush, tree limbs, tree dens, holes, etc.)

PROCEDURE:

1. Write recreation, business, and products across the top of the chalkboard. Help students define the words.
2. On a piece of scrap paper have students write a reason they think wild animals are important to people. Collect the papers.
3. Read each answer and have students decide under which heading it should be placed. Help students add to each column until most of the following responses are included:

recreation	business	product
hunting	food/lodging	food
trapping	transportation	clothing
fishing	equipment	decoration
hiking	licenses/fees	(wall mounts, hangings, etc.)
birdwatching	guides	
photographing	books/magazines	
boating	hunting dogs	
camping	fur market	

4. Explain that wild animals play an important part in our enjoyment of the outdoors. Explain that all animals need food, water and cover. Cover provides protection from other animals and from the weather. The place that provides all these things is called the animal's *habitat*.

5. Ask students what would happen to the things listed on the chalkboard if wildlife habitat is destroyed? (Wildlife would disappear and it would be more difficult to enjoy the outdoors.)
6. Have students complete the activity page.

- ACTION ACTIVITIES:**
1. Divide the class into groups. Have each group design a mobile that depicts the equipment and clothing used to catch or observe wildlife. For example, a mobile on birdwatching could include pictures of binoculars, bird book, notebook, car, backpack, hiking boots, thermos or cooler, etc. (If desired, students could find approximate prices of the items in a catalog and write them on the backs of the pictures.)
 2. Find out from your local Conservation Agent the current values for the different kinds of wild furs that can be sold. (coyote, fox, raccoon, beaver, etc.) Make a bar graph that shows the names of these animals and the price that each kind of fur will bring.
 3. Invite a local trapper, hunter, fisherman or other outdoor enthusiast to talk to the class about the equipment they use in the outdoors.

- CONSERVATION CHALLENGE:** The students can:
- AWARD ACTIVITIES:**
1. Write a story about their favorite Missouri wild animal: including where it lives, what it eats, where it raises its young, and why they like it.
 2. Make a picture display of Missouri wild animals that are hunted or trapped for their food value.

**ANSWERS TO
STUDENT PAGE:**

hunter/trapper—rifle, trap
 fisherman/boater—paddle, rod and reel
 birdwatcher/photographer—camera, binoculars
 backpacker/camper—tent, backpack

NAME _____

WE NEED WILDLIFE

DIRECTIONS: Match the kinds of equipment used with the kind of person that would most likely use it. Beneath each drawing, write the name of the equipment.



birdwatcher/photographer



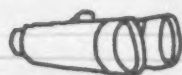
backpacker/camper



hunter/trapper



fisherman/boater



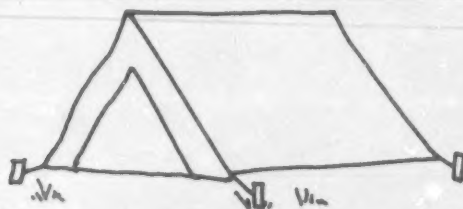
A _____



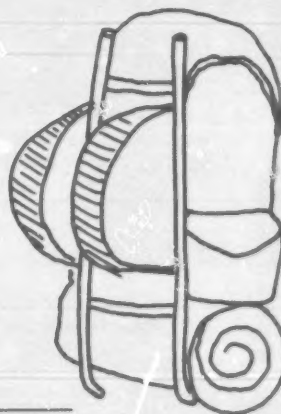
B _____



C _____



D _____



F _____



E _____

G _____



H _____

RARE AND ENDANGERED

3

WILDLIFE LESSON PLAN #4



BEST OBJECTIVES: #5, 13, 16, 17 (reading/language arts)

OBJECTIVES: After completing the activities, the students should be able to:

1. Define *rare*, *endangered*, and *extinct*.
2. Give two reasons animals may become rare or endangered.
3. Distinguish between endangered species and those which are not endangered.

CONSERVATION

CONCEPTS: #1, 4, 5, 7, 11

MATERIALS: pictures or models of a dinosaur, saber-toothed cat, a passenger pigeon or other extinct animal; "Conservation Successes" poster (optional)

TEACHER RESOURCE

WORDS:

1. rare: not often seen or found.
2. endangered: in danger of becoming extinct.
3. extinct: no longer found in living form.
4. species: a group of animals that are the same.

PROCEDURE:

1. Hold up pictures or models of a dinosaur, a saber-toothed cat, passenger pigeon or other extinct animal. Point out that this is a *passenger* pigeon and not a common pigeon. Ask students why we no longer see these animals. (extinct) Tell them that when all the animals of one kind are gone we say that animal is extinct.
2. Have students give reasons why animals become extinct. (loss or change of habitat and food supply, too many killed by people, changes in the environment which they cannot tolerate, etc.)
3. Tell students that animals which are not often seen or found are called *rare*. Have students name animals that were once plentiful in Missouri but are rarely seen now in the wild. (black bear, elk, buffalo, eagle, antelope, prairie chicken, trumpeter swan, otter, etc.)
4. Tell students that when rare animals are in danger of becoming extinct we say they are an *endangered species*. Write in *danger* and *endangered* on the chalkboard. Have students compare the words.
5. Tell students that many of the animals we hunt and trap today were once rare in Missouri. There were no wildlife laws and the animals had been hunted and trapped until they were almost gone. The efforts of conservationists and the citizens of Missouri helped bring back these animals such as the deer, turkey, raccoon, beaver, wood duck, Canada goose,

and others. Today these animals are no longer rare and can be hunted and trapped in accordance with the regulations of the Missouri Conservation Commission.

6. Have students complete the activity page.

ACTION ACTIVITIES: Help students find information about the river otter and the trumpeter swan. Both of these endangered species are being reintroduced to Missouri.

CONSERVATION The students can:

CHALLENGE: Design a T-shirt or bumper sticker advocating the protection of

AWARD ACTIVITIES: endangered species.

**ANSWERS TO
STUDENT PAGE:**

1. prey
2. hunt
3. wildlife
4. habitat
5. extinct
6. scavenger
7. rare
8. trap
9. predator
10. food

- QUIZ KEY:**
1. d
 2. d
 3. C
 4. E
 5. F
 6. A
 7. B
 8. D

NAME _____

RARE AND ENDANGERED

WORD BANK

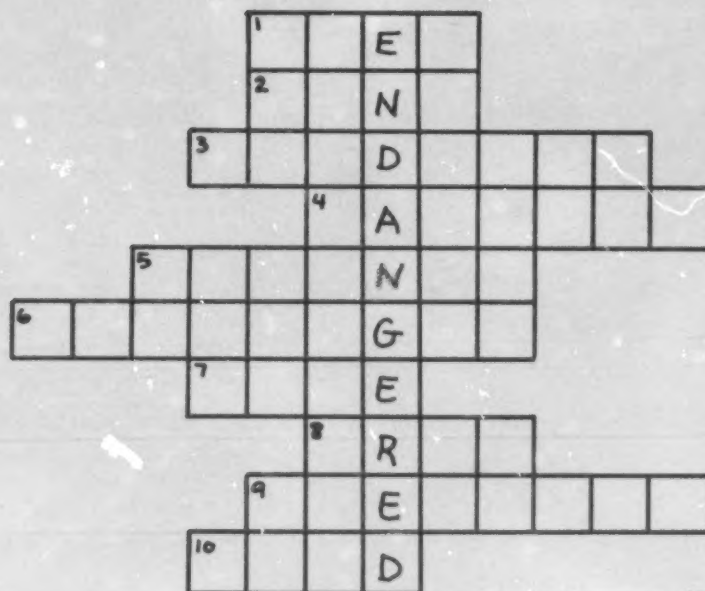
wildlife
habitat

trap
extinct

predator
scavenger

prey
food

hunt
rare



1. An animal that is caught and eaten by another animal.
2. To search for wild animals.
3. Untamed animals found in nature.
4. Place where an animal lives.
5. No longer found in living form.
6. Animal which eats dead animals that it did not kill.
7. Not often seen or found.
8. To catch wild animals for food or fur.
9. Animal which catches and eats other animals.
10. Something all animals need to live.

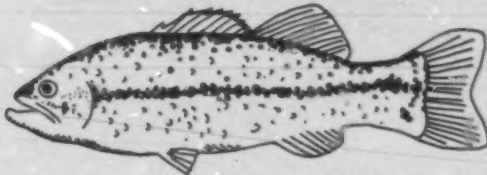
NAME _____

WILDLIFE QUIZ

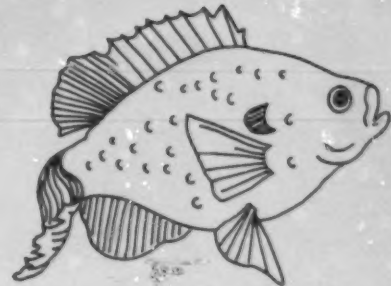
Circle the letter of the correct answer.

1. Which fish probably eats food on the bottom of a pond or stream?

a.



b.



c.



d.



2. Which of these businesses sell things that help us enjoy the out-of-doors?

- a. department store
- b. gas station
- c. cafe
- d. all of the above

Match the word with the definition.

- 3. _____ animal which captures and feeds on other animals
- 4. _____ not often seen or found
- 5. _____ animal which feeds on bodies of dead animals it did not kill
- 6. _____ in danger of becoming extinct
- 7. _____ no longer found in living form
- 8. _____ an animal that is captured and fed upon by another animal

- A. endangered
- B. extinct
- C. predator
- D. prey
- E. rare
- F. scavenger

PLANTS LESSON PLAN #1

BEST OBJECTIVES: #12, 15, 17 (reading/language arts)



OBJECTIVES: After completing the activities, the students should be able to:

1. Name four things a plant needs to live and grow.
2. Name the substance that makes plants green.
3. Recognize that all food comes directly or indirectly from plants.

CONSERVATION CONCEPTS: #3, 11, 12

MATERIALS: bean seeds, soil, clean milk cartons for pots, petroleum jelly, clear plastic bags, opaque plastic or paper bags, leafy plants

TEACHER RESOURCE

WORDS: chlorophyll: green coloring in plants

PROCEDURE:

1. Have students list reasons plants are important. (provide food, oxygen; use trees to build homes, make furniture and paper; etc.)
2. Have students speculate what would happen if there were no plants. What would we eat? How would we breathe? (Remember that plants are the beginning of all food chains so a meat diet is also dependent on plants.) What would hold soil on the land?
3. Point out that green plants need sunlight, air, water and soil to live.
4. Introduce the word *chlorophyll*. Tell students that it is the chemical that makes plants green. Tell them that chlorophyll needs sunlight to make it work. Sunlight and chlorophyll help plants make food from air and water. The soil helps the plant grow by providing materials for the plant to make new parts for itself.

ACTION ACTIVITIES:

1. Have students work in groups of three or four and plant three bean seeds in each of two cartons. Water both cartons and place one in a sunny window and one in a darkened cupboard. Check the plants every other day for two weeks. Which plant is greener? (light) Which plant is stronger? (light) Which plant has the longest stem? (dark) Which plant will probably live the longest? (light)
2. Have students cover a leaf with dark paper or a black plastic bag. Leave it for three days. What happens to the leaf? (turns yellow, loses its green color) Remove the paper and see what happens after several days. (green color returns)

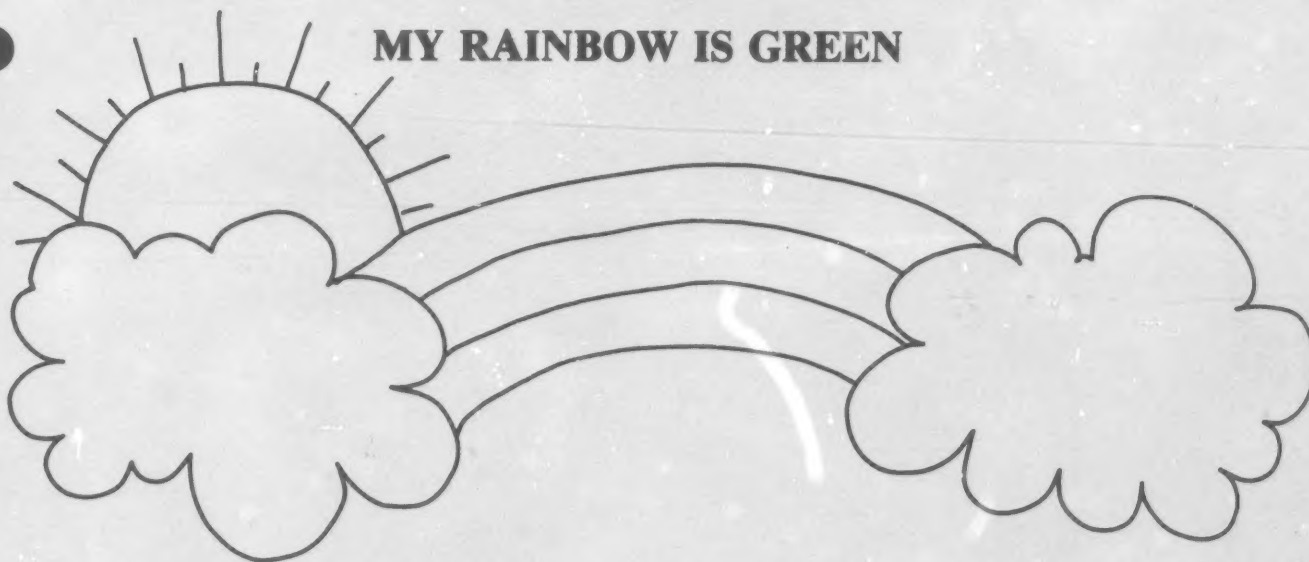
3. Have students plant bean seeds in cartons. Water one, but not the other. Observe after several days.
4. Soak pea or bean seeds in water overnight. Have students place them between a paper towel and a plastic lid. Keep the paper towel moist. How long do the seeds grow without soil?
5. Have students cover two leaves with petroleum jelly. What happens to the leaves after a week? Carefully remove the petroleum jelly from one of the leaves. What do you think caused the results?

CONSERVATION The students can:

- | | |
|--------------------------|--|
| CHALLENGE: | 1. Write a report on hydroponics or aquaculture of plants. |
| AWARD ACTIVITIES: | 2. Make a poster showing the types of plant parts we eat. |
| | 3. Design a bulletin board about plant needs entitled "My Rainbow is Green." |
| | 4. Design and conduct other plant experiments. |

NAME _____

MY RAINBOW IS GREEN



Use these words to write four sentences about plants. Underline these words in each sentence where they are used.

chlorophyll
leaves
green

air
roots
tree

water
food
soil

sunlight

THE MANY LIVES OF CATTAILS

3

PLANTS LESSON PLAN #2



BEST OBJECTIVES: #12, 15, 17, 19, 21 (reading/language arts); #4, 8, 9 (mathematics); #7 (government/economics)

OBJECTIVES: After completing the activities, the students should be able to:

1. Name four ways cattails can be used by people.
2. Compare ways animals and people might use cattails.
3. Create a mural of "The Many Lives of Cattails" using natural materials and arts-n-crafts materials.

**CONSERVATION
CONCEPTS:** #2, 3

MATERIALS: cattails (collect in late summer from wet areas); arts-n-crafts materials

TEACHER RESOURCE

WORDS: cattail: tall, reed-like plant with a brown head that grows around water. Note: for additional information see the April, 1978, issue of *Missouri Conservationist*.

PROCEDURE:

1. Have students visit a place where cattails are growing or display cattails in the classroom. Shred one of the seed heads to show the fluffy masses of seeds.
2. Have students form several small groups. Give each group a cattail. Have students list ways they think the roots, stems, leaves and seeds could be used.
3. Discuss the group's ideas in class. Have the class compare different ways animals and people might use cattails.
4. Have students complete the activity page.
5. Have each group design a mural entitled "The Many Lives of Cattails." Group members should stress in their murals how animals and people use cattails similarly and differently.
6. Conclude the activity with students presenting a persuasive advertisement that supports the protection of cattails.

ACTION ACTIVITIES:

1. Have students pretend they are pioneers. Have students write letters to a person living in St. Louis describing the many uses of cattails taught to them by the Indians.
2. Have the class find cattail recipes in a book on wild edibles. Increase the recipes to feed the whole class.

CONSERVATION The students can:

CHALLENGE:

1. Make a cattail mat for the floor or make a small pillow using cattail fluff for the stuffing and muslin for the cover.

AWARD ACTIVITIES:

2. Write a report about how the Indians used cattails and other plants.
3. Make a floral arrangement using cattails and other plants.

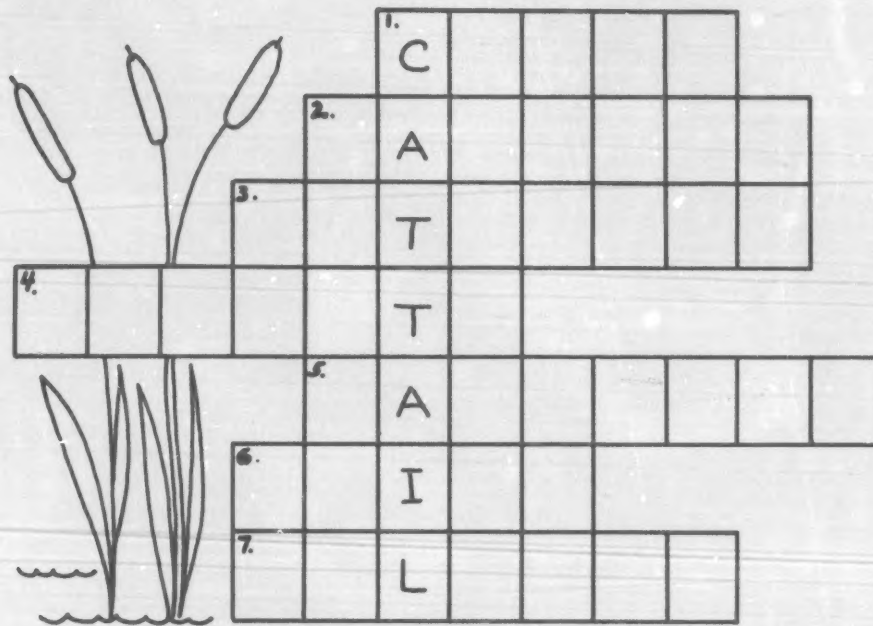
**ANSWERS TO
STUDENT PAGE:**

1. CHAIR
2. PANCAKE
3. POTATOES
4. SPROUTS
5. MATTRESS
6. BLIND
7. PILLOWS

NAME _____

THE MANY LIVES OF CATTAILS

Find out how useful cattails can be to people. Read each clue. Unscramble the answer. Write the correct answer in the numbered box.



1. The leaves can be dried and woven into ahirc seats.
2. The pollen can be ground and used for aackenp flour.
3. Cattail roots can be used instead of ooaettps in some dishes.
4. In the early spring, dig up the cattails and use the ssptuor in salads.
5. The fluffy seeds can be used for a satstrme.
6. The dried reeds can be woven into a window nblid.
7. During W.W. II, pounds of the fluffy seeds were used to stuff llwopis, life jackets and baseballs.

MATCHING OUT WILDFLOWERS

3

PLANTS LESSON PLAN #3

BEST OBJECTIVES: #12, 13, 17, 21 (reading/language arts); #1, 8 (mathematics)



OBJECTIVES: After completing the activities, the students should be able to:

1. Correctly add and subtract math problems.
2. Use a code to find a secret message.
3. Describe the importance of conserving wildflowers.

CONSERVATION CONCEPTS: #1, 2, 5, 10

MATERIALS: "Common Roadside Wildflowers" poster (optional)

TEACHER RESOURCE

WORDS: wildflowers: uncultivated flowers which grow naturally and bloom from mid-March to the end of November.

- PROCEDURE:**
1. (optional) Display the poster "Common Roadside Wildflowers."
 2. Have students describe any wildflowers they have seen.
 3. Have students complete the activity page.
 4. Discuss the importance of *not* picking wildflowers. Include the fact that wildflowers provide food for wildlife.
 5. Have each student design a poster advising other people not to pick wildflowers.
 6. Have the class learn the song, "Wildflowers" on p. 68 of *Missouri Conservation Melodies*, available from your local music teacher or the Missouri Department of Conservation.

- ACTION ACTIVITIES:**
1. Take the class outdoors to find wildflowers. Make the following chart and have students place an "X" in the boxes when they find a wildflower with those characteristics.

	white	red	yellow	purple	blue	other
fuzzy						
bell-shaped						
yellow center						
brown center						

2. Have a classroom play entitled "The Wildflower—napper."
Have several students be wildflowers that are "napped" by
several villains and rescued by several heroes. The villains
might be: "The Trumpet Creeper Snatcher"
"Hot Fingers"
"Sticker Picker"

The heroes might be: "Conserve Caper"
"Picker Stopper"
"Snatcher Getter"
"Flower Power"

CONSERVATION The students can:

- CHALLENGE:** 1. Write a poem telling why wildflowers are special.
AWARD ACTIVITIES: 2. Write and illustrate a story about not picking wildflowers for
first graders.

ANSWERS TO
STUDENT PAGE: Wildflowers should be left for others to enjoy.

NAME _____

MATCHING OUT WILDFLOWERS

Add or subtract the problems. Use the code to find each letter. Read the message.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

21	7	6	2	5	7	10	20	4	9	20
+2	+2	+6	+2	+1	+5	+5	+3	+1	+9	-1

--	--	--	--	--	--	--	--	--	--	--

17	5	17	16	4	1
+2	+3	-2	+5	+8	+3

2	8
+0	-3

9	10	4	10
+3	-5	+2	+10

--	--	--	--	--	--

--	--

--	--	--	--

3	7	12
+3	+8	+6

9	21	6	7	10	23
+6	-1	+2	-2	+8	-4

8	18
+12	-3

--	--	--

--	--	--	--	--	--

--	--

4	7	9	18	12
+1	+7	+1	-3	+13

--	--	--	--	--



MATCHING TREES

3

PLANTS LESSON PLAN #4



BEST OBJECTIVES: #13, 17 (reading/language arts); #8 (mathematics)

OBJECTIVES: After completing the activities, the students should be able to:

1. Name at least four trees found in Missouri.
2. Identify leaf shapes of at least four Missouri trees.
3. Name five products of trees that have been cut.
4. Name three uses for trees which have not been cut.

**CONSERVATION
CONCEPTS:** #2, 3, 5

MATERIALS: laminating film and machine, or clear contact paper

PROCEDURE:

1. Make enough copies of the tree cards so that there are two of each card per group of two to four students. (16 cards per deck) Laminate or cover with clear contact paper before cutting out.
2. Teach students the song "*Take Care of Our Trees*" on p. 114 of *Missouri Conservation Melodies*, available from your local music teacher or the Missouri Department of Conservation.
3. Have students name some things we get from trees that have been cut. (furniture, homes, firewood telephone poles, railroad ties, etc.)
4. Have students name some benefits of trees that have not been cut. (shade, protection from wind, fruit and nuts, swings, decoration, wildlife homes, etc.)
5. Pass out the leaf cards. Discuss the shapes of the leaves with students. Help students recognize leaf shapes and names.
6. Divide the class into groups of two to four students. Have students use the laminated leaf cards to play the following game.
 - a. Pass out all cards face down to players.
 - b. Players look at cards and lay matched pairs in front of them.
 - c. Each player (starting with the dealer) selects a card from the player on the right until all pair combinations have been made.
 - d. The person with the most pairs wins.
 - e. (Optional) Count one point for each pair and total points after all players have had a chance to deal.

ACTION ACTIVITIES:

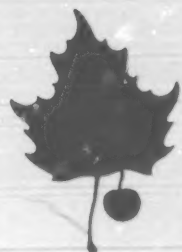
1. Take students outdoors to find leaves that match the ones on the cards. Have students draw pictures or make pencil tracings of leaves that are not on the cards.

2. Use the leaf cards to play other card games such as Concentration and Go Fish. Add an additional "wild card" to play Old Maid.

- CONSERVATION** The students can:
- CHALLENGE:** 1. Make leaf and bark tracings from different trees in the community. Identification is not necessary but could be done as appropriate.
- AWARD ACTIVITIES:** 2. Find or draw pictures of trees and match them with pictures of products or uses of trees.

QUIZ KEY: 1. b 2. b 3. a 4. a
5. c 6. b 7. d 8. a

SYCAMORE



WHITE OAK



BLACK WALNUT



SHAGBARK HICKORY



SWEET GUM



DOGWOOD



REDBUD



RED CEDAR



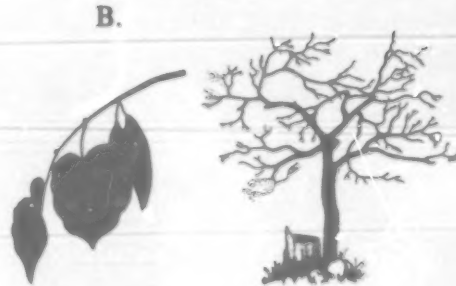
NAME _____

PLANTS QUIZ

1. Chlorophyll makes plants:
 - a. grow fast
 - b. green
 - c. die
2. Besides sunlight and chlorophyll, plants also need _____ to make food.
 - a. food, water and shelter
 - b. soil, air and water
 - c. land, sea and sky
3. Cattails can be used for:
 - a. food
 - b. clothing
 - c. shelter
4. Wildflowers should not be picked.
 - a. true
 - b. not true

Match the leaf with the tree name.

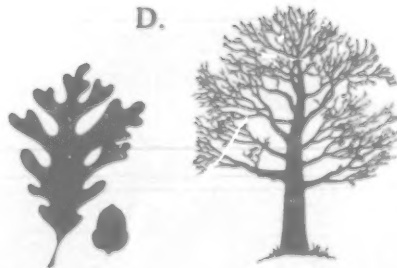
- _____ 5. sweet gum
- _____ 6. redbud
- _____ 7. white oak
- _____ 8. red cedar



C.



D.



WATER AND AQUATIC LIFE LESSON PLAN #1

BEST OBJECTIVES: #6, 12, 13, 21 (reading/language arts); #2, 8 (mathematics)



OBJECTIVES: After completing the activities, the students should be able to:

1. Name five ways a large community uses water.
2. Name three ways water is used on a farm.
3. Name three ways water can be conserved.

CONSERVATION CONCEPTS: #1, 5, 6, 10

- PROCEDURE:**
1. Have students imagine they are pioneers looking for a place to build their home. Have them list things that would be important in selecting a site. (convenient sources of water, food and building materials; ease of defending against attack; etc.) Ask students how important a reliable source of water would be. (probably the most important thing)
 2. Point out that many of today's major cities are located near a good water supply. Have students discuss ways large communities use water. Make a list of these uses.
 3. Have students discuss how water is used by farmers. Compare water use in cities and on large farms. (Cities usually have industrial water uses while farms have irrigation and livestock uses.)
 4. Have students complete the activity page.

- ACTION ACTIVITIES:**
1. Review the water cycle with students. Have students design a bulletin board display which shows the ways water can be used as it cycles through the environment.
 2. Have students make a list of ways water is wasted. (leaks, leaving water run while brushing teeth, leaving faucet run to get cold water for drinking, watering lawns until the street is wet, etc.) Have students discuss and make a list of ways water can be conserved.

CONSERVATION The students can:

CHALLENGE: Find out how much their family pays for water each month. (If

AWARD ACTIVITIES: they use water from a well, they can find out how much the water pump cost.)

ANSWERS TO STUDENT PAGE:

1. home use 2. industries 3. produce electricity
4. transportation 5. recreation 6. carries away wastes
7. crops 8. livestock 9. irrigation 10. fishing

NAME _____

WATER MATH OUT

Find out why modern communities need a large supply of water. Solve the math problems. Use the letters to fill in the water uses.

Ways communities use water:

1. $\frac{8}{6} \frac{2}{16} \frac{21}{20} \frac{3}{1}$ $\frac{7}{7} \frac{3}{3}$

$4 \times 8 =$

$8 \div 2 =$

$10 \times 2 =$

2. $\frac{6}{6} \frac{16}{16} \frac{20}{20} \frac{1}{1} \frac{7}{7} \frac{12}{12} \frac{5}{5} \frac{6}{6} \frac{3}{3} \frac{7}{7}$

$9 \div 3 =$

$5 \times 5 =$

$6 \times 4 =$

3. $\frac{14}{3} \frac{5}{27} \frac{2}{3} \frac{20}{4} \frac{1}{12} \frac{4}{5} \frac{3}{6}$

$2 \times 4 =$

$2 \times 3 =$

4. $\frac{12}{12} \frac{5}{5} \frac{32}{32} \frac{16}{16} \frac{7}{7} \frac{14}{14} \frac{2}{2} \frac{5}{5} \frac{12}{12} \frac{32}{32} \frac{12}{12} \frac{6}{6} \frac{2}{2} \frac{16}{16}$

$9 \times 2 =$

$9 \times 3 =$

5. $\frac{5}{5} \frac{3}{3} \frac{4}{4} \frac{5}{5} \frac{3}{3} \frac{32}{32} \frac{12}{12} \frac{6}{6} \frac{2}{2} \frac{16}{16}$

6. $\frac{4}{32} \frac{32}{15} \frac{5}{32} \frac{5}{9} \frac{6}{3} \frac{3}{7}$

$3 \times 7 =$

$4 \times 4 =$

$10 \div 5 =$

$\frac{15}{15} \frac{32}{32} \frac{7}{7} \frac{12}{12} \frac{3}{3} \frac{7}{7}$

7. $\frac{4}{4} \frac{5}{5} \frac{2}{2} \frac{14}{14} \frac{7}{7}$

$7 \times 2 =$

$1 \times 5 =$

$21 \div 3 =$

8. $\frac{27}{27} \frac{6}{6} \frac{10}{10} \frac{3}{3} \frac{7}{7} \frac{12}{12} \frac{2}{2} \frac{4}{4} \frac{18}{18}$

9. $\frac{6}{6} \frac{5}{5} \frac{5}{5} \frac{6}{6} \frac{24}{24} \frac{32}{32} \frac{12}{12} \frac{6}{6} \frac{2}{2} \frac{16}{16}$

$3 \div 4 =$

$6 \div 6 =$

10. $\frac{25}{25} \frac{6}{6} \frac{7}{7} \frac{8}{8} \frac{6}{6} \frac{26}{26} \frac{24}{24}$

$2 \times 5 =$

$5 \times 3 =$

$18 \div 2 =$

CRUISING DOWN THE RIVER

3

WATER AND AQUATIC LIFE LESSON PLAN #2

BEST OBJECTIVES: #12, 14, 15, 17, 21 (reading/language arts); #8 (mathematics)



- OBJECTIVES:** After completing the activities, the students should be able to:
1. Identify the two major rivers in Missouri and locate them on a map.
 2. Give four reasons rivers are important.
 3. Name two things that harm river water.

**CONSERVATION
CONCEPTS:** #2, 12, 13

MATERIALS: map of Mississippi—Missouri river system

- PROCEDURE:**
1. Ask students if they have ever ridden in a boat. What kind of boat was it? Why were they in the boat?
 2. Have students give reasons for using boats. (fishing, checking water quality, sand dredging, transporting goods, recreation, etc.)
 3. Have students name places in Missouri where boats are used. (Missouri and Mississippi rivers, Lake of the Ozarks, other major lakes, numerous small lakes and rivers, farm ponds, etc.)
 4. Point out that Missouri has two large rivers. What are they? (Missouri and Mississippi) Have students locate these rivers on a map and discuss their importance. (drinking water, transportation, commercial fishing, water used in industrial processes, carries away wastes, wildlife habitat along shores and islands, migratory birds follow them, sand and gravel operations, etc.)
 5. Briefly discuss the early history of the Mississippi—Missouri river system. (Louisiana purchase; Lewis and Clark; trappers and hunters; etc.)
 6. Discuss things that are harmful to river water. (pollution from chemical wastes, soil erosion, litter and trash, etc.) Also discuss ways to prevent water pollution.
 7. Have students complete the activity page.

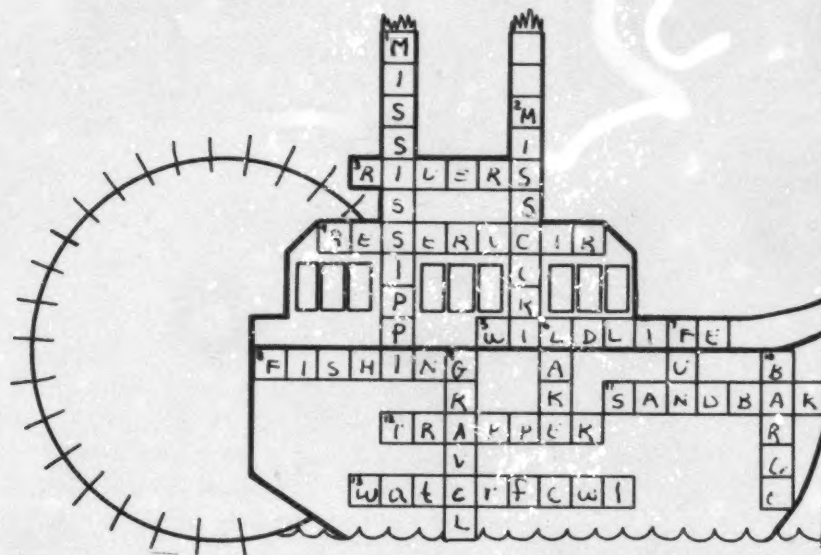
- ACTION ACTIVITIES:**
1. Migrating water fowl fly over Missouri in spring and fall. They stop to rest and feed in river-bottom fields at refuges. Make a bulletin board depicting the Mississippi Flyway migratory route. Have students find pictures of waterfowl and post them around the migratory map.
 2. Sing or listen to some river songs, such as "*Chant of the Rivers*," or "*River of the Big Canoes*" from Missouri Conservation Melodies. (available from your local music teacher or the Missouri Department of Conservation)

3. Have students make a mural of the animals which might have been seen by early explorers as they traveled the rivers of Missouri.

CONSERVATION
CHALLENGE:
AWARD ACTIVITIES:

The students can:

1. Write a paragraph emphasizing the importance of water for recreational purposes. They should suggest ways to protect the water in their paragraph.
2. Draw or find pictures of various boats used by early settlers.
3. Build a model riverboat like the ones on the Missouri and Mississippi in Tom Sawyer's day.

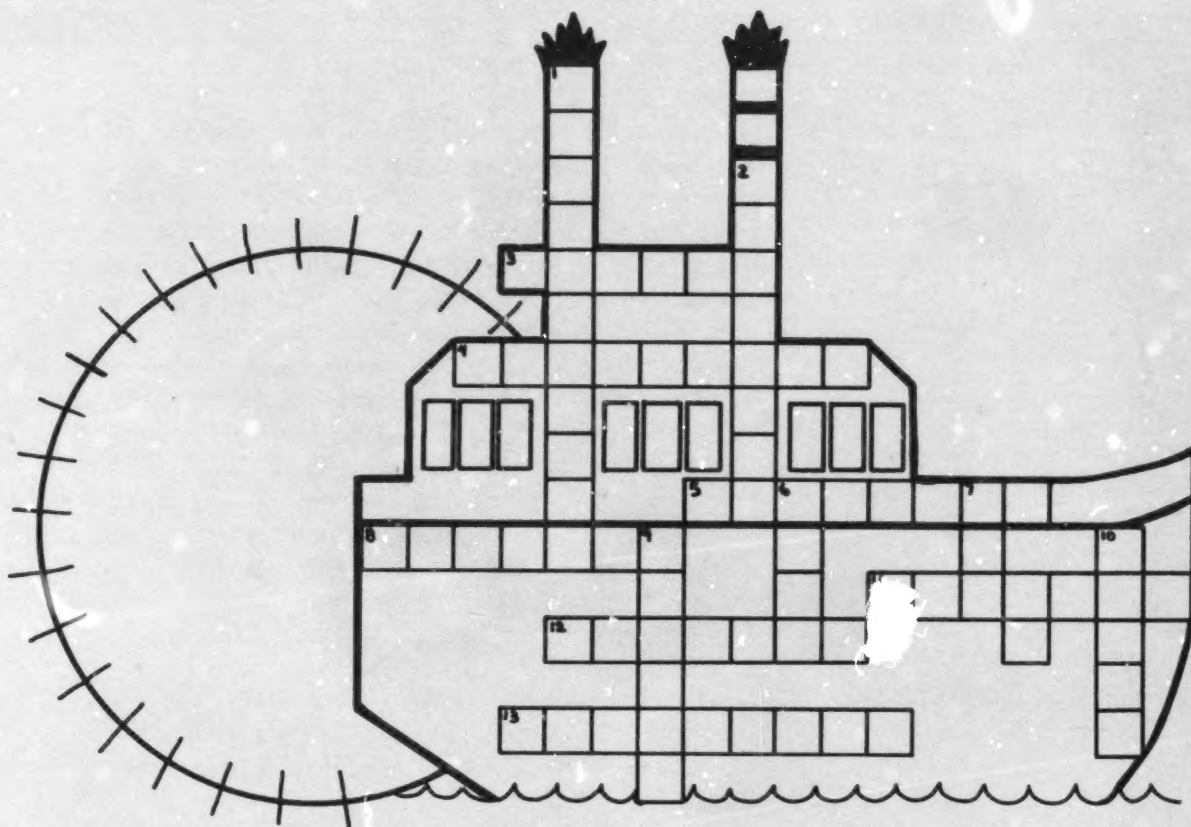


NAME _____

CRUISING DOWN THE RIVER

WORD BANK:

fun	lake	waterfowl
fishing	reservoir	wildlife
Mississippi	barge	trapper
Missouri	sandbar	
rivers	gravel	



ACROSS

3. large streams
4. place where water is stored
5. wild animals living near rivers and streams
8. trying to catch water animals
11. island of sand
12. Person who catches animals with fur along rivers.
13. duck, geese, swans

DOWN

1. large river on eastern border of Missouri
2. river which travels from Kansas City to St. Louis
6. a large body of water
7. having a good time on the river
9. pieces of rock
10. flat boat used to carry grain and rocks

WHAT'S WITH THE WATER WORD BOAT?

3

WATER AND AQUATIC LIFE LESSON PLAN #3

BEST OBJECTIVES: #6, 8, 12, 13, 15, 21 (reading/language arts)



OBJECTIVES: After completing the activities, the students should be able to:

1. Classify words according to their relationship to water.
2. Recognize aquatic plants, animals, and nonliving things associated with water.
3. Make a list of things that adversely affect aquatic plants and animals.

CONSERVATION

CONCEPTS: #1, 2, 3, 10

MATERIALS: beans or popcorn for "bingo" cards

- PROCEDURE:**
1. Have students name plants and animals that are found in or near water. Make a list on the chalkboard and one on paper squares.
 2. Have students make a "bingo" card using some of the words. Play the game by drawing the squares and having students cover the words on their cards until you have a winner. Do *not* remove markers at this time.
 3. Discuss causes of water pollution. (wastes from sewage and industry; eroded soil; heated water; acid rain; trash; etc.)
 4. Put all the paper "bingo" squares back in the container. This time have students *remove* a marker if their plant or animal is called. When they have no markers left their river is polluted. Tell students that rivers are polluted long before all life disappears and that some life is usually found in even the most polluted water.
 5. Have students name ways to prevent pollution.

- ACTION ACTIVITIES:**
1. Have students bring in pictures and classify the pictures into the same groupings as the words; i.e., aquatic plants, animals nonliving aquatic things; things that harm the water life.
 2. Have students make "aquatic plants" using tissue paper, pipe cleaners and other art materials.
 3. Have students make these into a mobile or place a "water line" near the ceiling and decorate the classroom as if it were under water.
 4. Have students visit an aquarium or pet store. What kinds of plants are used in an aquarium? What changes can disrupt the growth of plants? (temperature, light, chemicals, etc.) How do these changes affect aquatic plants in natural bodies of water?

**CONSERVATION
CHALLENGE:
AWARD ACTIVITIES:**

The students can:

1. Design a maze where a fish tries to reach a particular plant. Swap the mazes between students.
2. Design a hidden word puzzle using the words from the activity page.

**ANSWERS TO
STUDENT PAGE:**

1. WATER PLANTS

duckweed
lotus
algae
cattail
water lily

2. WATER ANIMALS

snail
bass
crayfish
mayfly
frog
turtle
bluegill
bloodworm
fish
tadpole
beetle

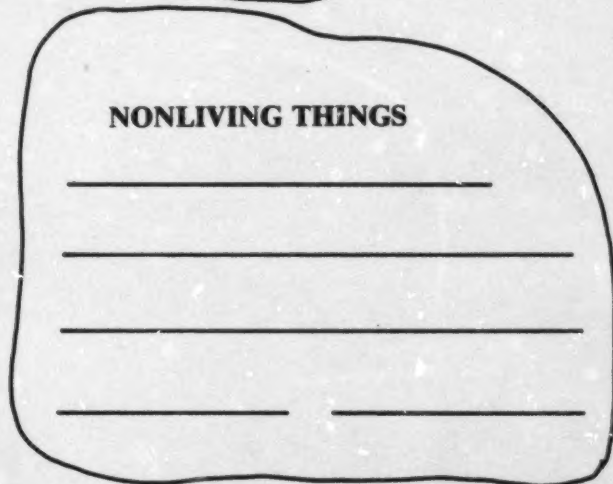
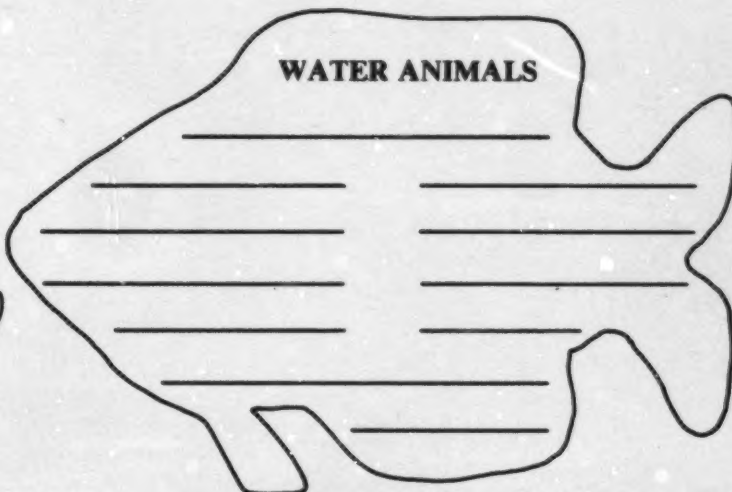
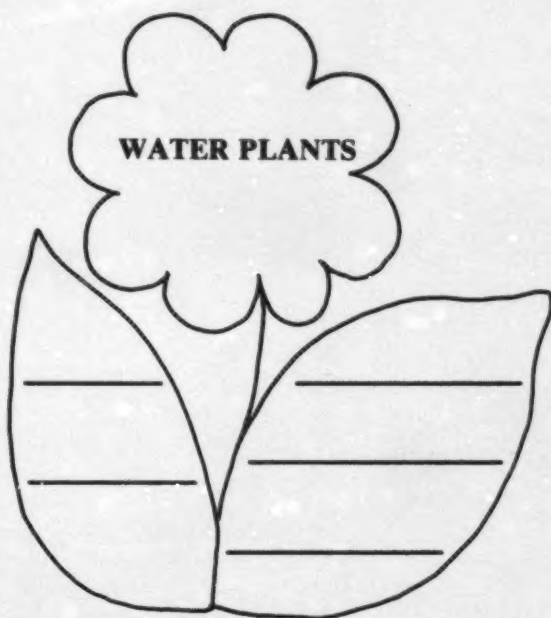
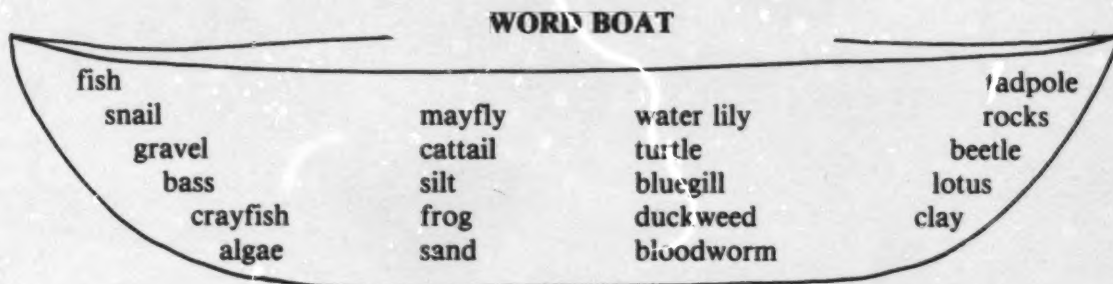
3. NONLIVING THINGS

gravel
silt
sand
rocks
clay

NAME _____

WHAT'S WITH THE WATER WORD BOAT?

Write the words from the "WORD BOAT" in the correct groups below. Fill in the box with your own words.



THINGS THAT HARM WATER LIFE
Fill this in with your own words

EGGS AND MORE

3

WATER AND AQUATIC LIFE LESSON PLAN #4

BEST OBJECTIVES: #5, 6, 12, 13, 21 (reading/language arts); #1 (mathematics)



OBJECTIVES: After completing the activities, the students should be able to:

1. Name four things that keep fish eggs from hatching.
2. Subtract numbers in groups of 50's.
3. Define "limiting factors."
4. Explain how people influence the number of fish eggs that hatch.

**CONSERVATION
CONCEPTS:** #1, 4, 11, 12

MATERIALS: coin; game markers; films: "Millions of Mister Whiskers" or "Ozark Rainbow;" aquarium set-up; eggs and incubator

**TEACHER RESOURCE
WORDS:**

1. population: a group of organisms of the same kind living in a specific area at a given time.
2. density: the number of individuals in any given space.
3. limiting factors: things which limit the numbers of a population. Examples include: disease, food supply, cover, temperature range, etc.

PROCEDURE:

1. Read the paragraph at the bottom of the student page.
2. What would happen if *all* the fish eggs hatched? (There would be too many fish for the available amount of food, cover and space. Most would probably be eaten because there wouldn't be enough hiding places.)
3. Have students identify the things that limit fish eggs from hatching.
4. Define "limiting factors" as things that keep down the numbers of animals.
5. Have students play the game individually or in small groups. The one with the most eggs left at the end is the winner.
6. At the end of the game, ask students which of the hazards in the game are caused by people? (erosion, acid rain, pollution, wading)

ACTION ACTIVITIES:

1. See film "Millions of Mister Whiskers" or "Ozark Rainbow." (ordered 4-6 weeks in advance from Missouri Department of Conservation film loan)
2. Set up an aquarium in the classroom.
3. Visit a Department of Conservation fish hatchery.

- CONSERVATION** The students can:
- CHALLENGE:** 1. Write three math problems that focus on the number of animals in an area.
- AWARD ACTIVITIES:** 2. Make a list of other animals that lay eggs. Try to find out how many eggs they lay at a time. Are there any extinct animals that laid eggs?

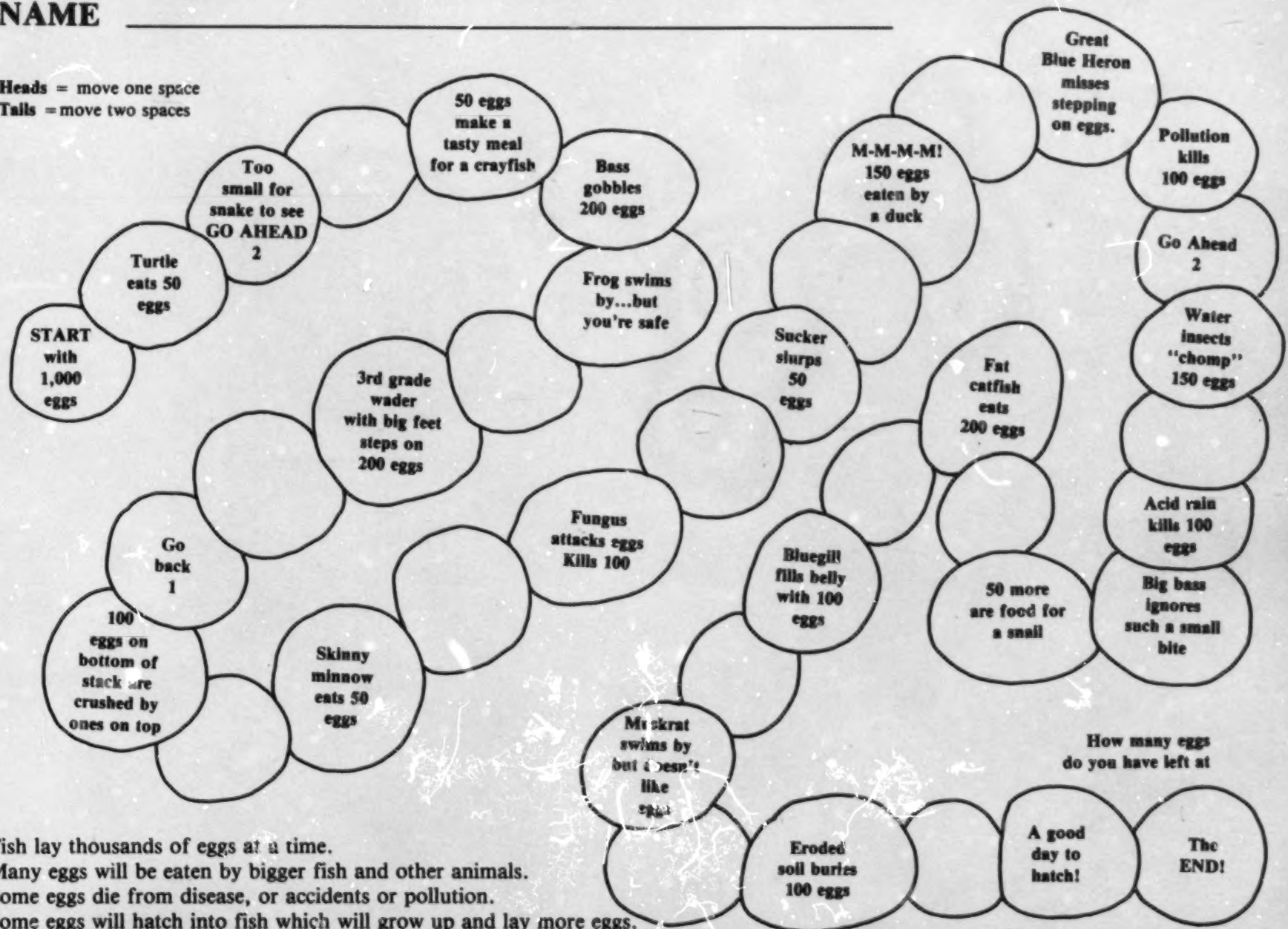
- QUIZ KEY:** 1. d 2. a 3. c 4. b
5. Plants: cattail, duckweed, water lily, algae
Animals: fish, snail, tadpole, turtle
6. b, d.

NAME _____

Heads = move one space

Tails = move two spaces

93



Fish lay thousands of eggs at a time.
Many eggs will be eaten by bigger fish and other animals.
Some eggs die from disease, or accidents or pollution.
Some eggs will hatch into fish which will grow up and lay more eggs.

NAME _____

WATER AND AQUATIC LIFE QUIZ

Circle the letter of the correct answer.

1. Water is used on a farm for
 - a. irrigation
 - b. home use
 - c. livestock
 - d. all of the above
2. Communities use large amounts of water to
 - a. carry away wastes
 - b. build canoes
 - c. wash cats and dogs
3. Two major rivers in Missouri are
 - a. Missouri and Ohio
 - b. Mississippi and Colorado
 - c. Missouri and Mississippi
 - d. Colorado and Ohio
4. Ducks, geese and swans are called
 - a. water logs
 - b. waterfowl
 - c. sand bars
 - d. barges
5. Write these words in the correct boxes below.

fish
snail
cattail
tadpole
duckweed
turtle
water lily
algae

PLANTS

ANIMALS

6. Circle the letters of things that might keep fish eggs from hatching.

a. water

b. acid rain

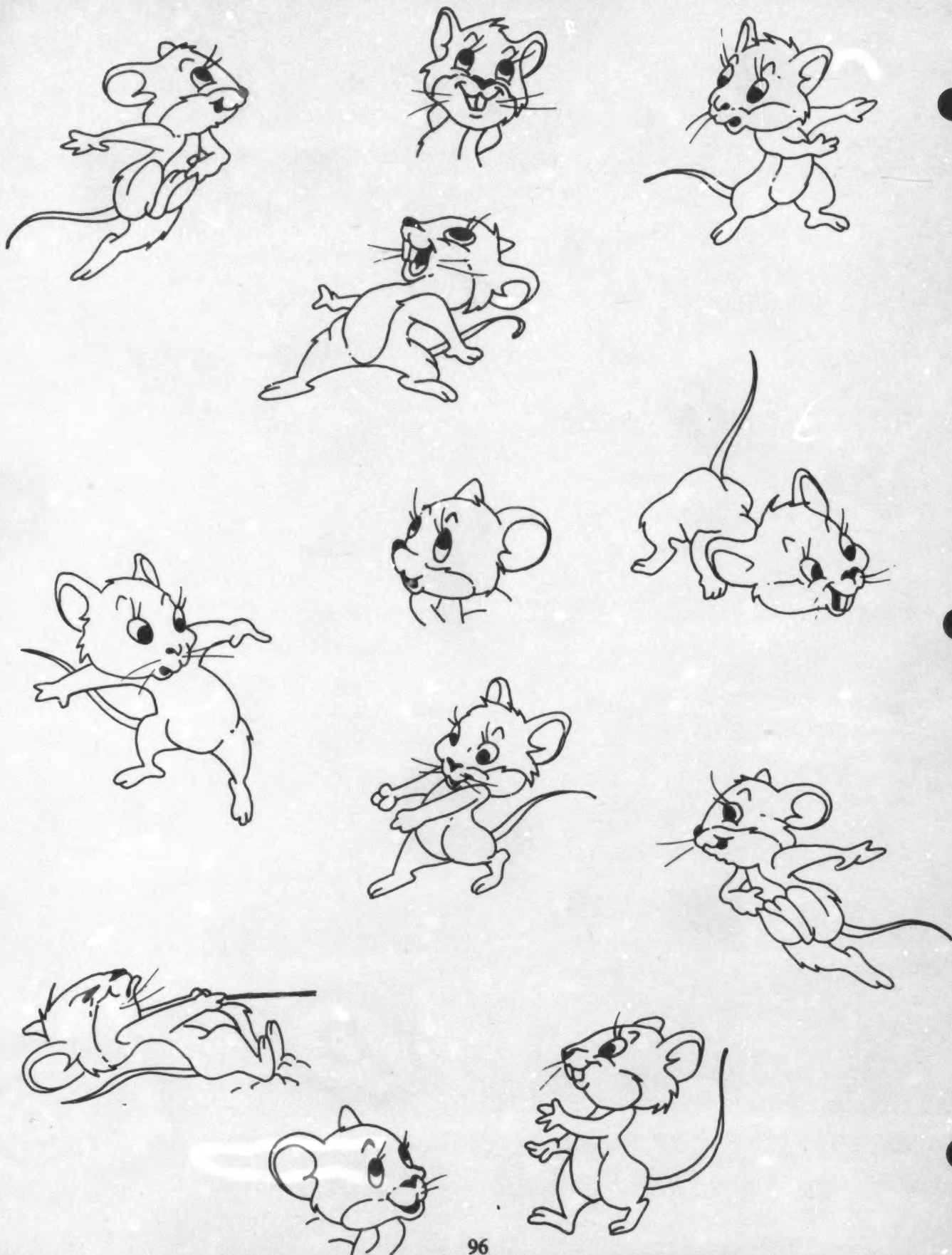
c. rocks

d. fungus

e. mole

OTIS SKETCHES





Missouri Department of Conservation
Education Section
P.O. Box 180
Jefferson City, Missouri 65102

For Teachers & Youth Leaders Only

Name: _____ School: _____
Mailing Address: _____ District: _____ County: _____
_____ No. of Pupils: _____ Grade Level: _____
_____ Zip: _____ Date: _____

Conservation Education

- _____ Conservation Education for Nursery,
Headstart & Kindergarten
- _____ Ecology at School
- _____ Ecological Approach to Conservation Education
- _____ Conservation Education Film Source
- _____ Food Web Scramble Game
- _____ Missouri Conservation Department Film Source List
- _____ Teach Conservation, But I Teach English
- _____ We Cleaned It Up (puppet show)
- _____ Boy Scout Study Guide for Wildlife Management
Merit Badge
- _____ Conservation Chart and Guide
- _____ Cemetery Study/Wall Chart
- _____ Conservation is Caring-Idea Book
(available in classroom quantities)
- _____ 3-D Fish Pak
- _____ 3-D Insect Pak
- _____ 3-D Wildflower Pak

Conservation

- _____ Conservation Section - Mo. Constitution
- _____ Conservation at the Science Fair
- _____ What Can I Do?
- _____ Predators Are Like People
- _____ The Soil Pyramid of Life
- _____ Arbor Day
- _____ Let's Sing Conservation
- _____ Smokey Bear Song Sheet/Conservation Pledge
- _____ Bluebird Nest Box Plans

Wildlife

- _____ Beaver
- _____ Bobcat
- _____ Cottontail Rabbit
- _____ Coyote
- _____ Fox
- _____ Mink
- _____ Mountain Lion
- _____ Muskrat
- _____ Opossum
- _____ Raccoon
- _____ Skunk
- _____ Squirrels
- _____ White-tailed Deer
- _____ Woodchuck
- _____ Prairie Chicken
- _____ Introduction to Bird Study
- _____ Introduction to Missouri Fishes
- _____ Animal Autographs
- _____ Life History of the Important Hook & Line Fishes in
Missouri & Life History Chart of Missouri Mammals

- _____ Missouri Game Animals & Furbearers
- _____ Missouri Turtles
- _____ Snakes & Facts About Them
- _____ Missouri's Frogs and Toads

Where to go

- _____ Outdoor Missouri Map
- _____ Recreation for the Handicapped

Miscellaneous

- _____ Beneficial Weeds
- _____ Wild Menu
- _____ Bird Day
- _____ Bluebird Nest Box Plans
- _____ Wood Duck Nesting Box
- _____ Edible and Poisonous Mushrooms

Wildlife Management

- _____ Missouri Pond Handbook*
- _____ Manage Your Woodlands for Wildlife
- _____ Feeding Back Yard Birds
- _____ Let's Talk Turkey*
- _____ Dens for Squirrels

Hunting & Fishing

- _____ Wildlife Code of Missouri*
- _____ Fishing Seasons & Limits
- _____ How to Catch Fish*
- _____ Deer Hunting in Missouri
- _____ Show Me Squirrel Hunting

Forestry

- _____ Missouri Trees*
- _____ Forest Fires in Missouri*
- _____ Common Trees of Missouri
- _____ The Flowering Dogwood
- _____ Trees for Urban Missouri*

Publications marked with an asterisk (*) are multiple page bulletins which are, in many cases, quite expensive. The quantities for these will usually be limited. If you can substitute one of the less expensive publications, please do so.

Please be conservative with your request. If you ask for more than 5 of any publications, please justify. These publications or any part thereof may be reproduced for classroom use.

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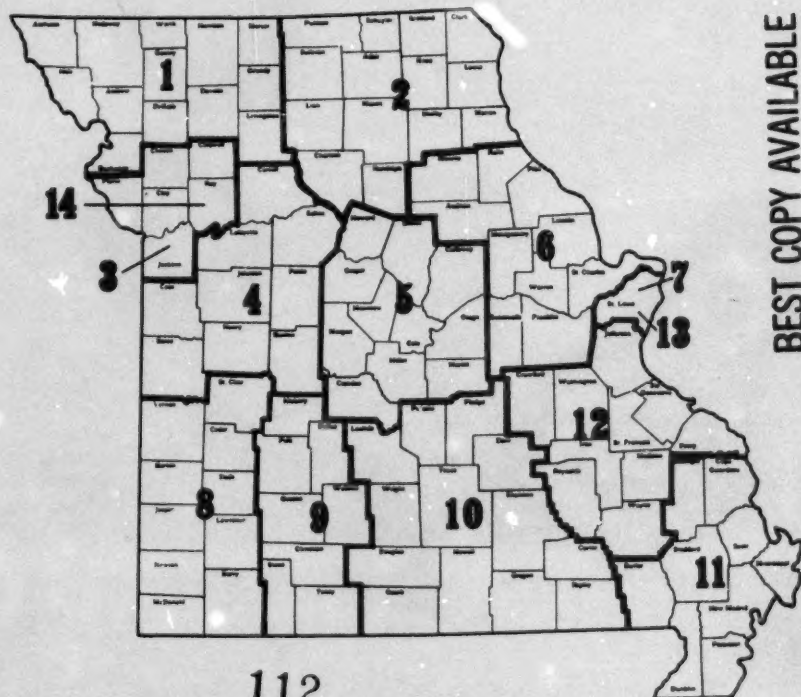
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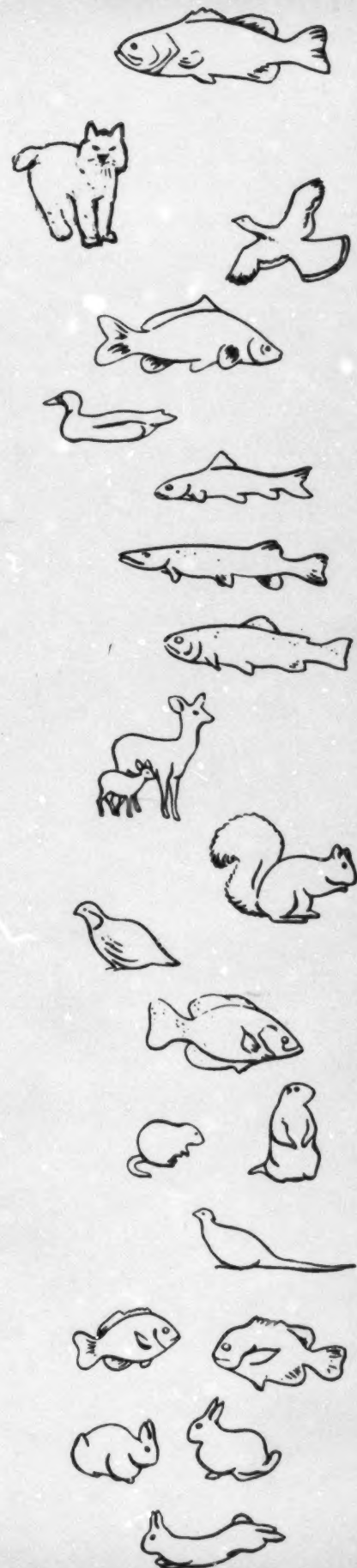
Conservation Chart

Education Section
Missouri Department of Conservation
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and

Sport Fishing Institute
608 - 13th St., N.W.
Washington, D.C. 20005



ACKNOWLEDGEMENT

The Conservation Chart and Text was developed by Dr. R. W. Eschmeyer the first Executive Vice President of the Sport Fishing Institute. Art work was by Bob Hines of the U. S. Fish and Wildlife Service and Oscar Warbach of the Michigan Department of Conservation.

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DIRECTIONS FOR COMPLETING CONSERVATION CHART

To finish your conservation chart, follow these directions:

First: Unfold the chart. If you wish, you can iron out the creases with a warm iron. Iron on the back side of the chart. If the iron is too hot it will scorch the paper!

Second: Study the chart. Notice that it is a picture of two valleys. The valleys differ from each other. Can you point out some of the differences? Learn the names of the three towns, and the two rivers and two lakes.

Third: Read the story of the two valleys, pages 4 to 6. We call it "The Conservation Story."

Fourth: You are now ready to put the animals where they belong on the chart. Cut along the outside of the white border at the right side of the chart, separating the strip with the animals from the chart itself.

Fifth: Do not cut out any of the animals until the directions tell you to do so. When you do cut them out, cut around the outside of the white border which you see around each animal. Now turn to page 7. This page, and those which follow it, tell you how to finish the chart. As you read, you will find the instructions which you are to follow.

Sixth: When you have finished the chart, you will want to study it again, and will want to re-read the conservation story. The chart teaches a very important lesson. You will not want to forget what you have learned about the wise use of our land, soil, water, woods, and wildlife.

Seventh: On page 15 there are suggestions about things you can do. Read these suggestions. You might wish to follow some of them. You will enjoy learning about your valley.

THE CONSERVATION STORY

Muddy River Valley and Clear River Valley were alike when settlers first saw them. In the one valley, the people took good care of their soil, water, woods, and fish and game. In the other valley they were careless. They destroyed the very things that meant so much to them.

As you look at the two valleys on the chart, you can decide very easily in which of them you would prefer to live. You wouldn't want to live in Muddy River Valley. You would enjoy living in Clear River Valley.

MUDDY RIVER VALLEY

When settlers first saw Muddy River Valley, the land was covered with tall trees. There were many wild turkeys, gray squirrels, bobcats, bears, and other animals of the big forest. Clear, cool streams flowed from the hillsides. They emptied into the big river.

The stream wasn't called Muddy River then. It was clear and cool. It was called Cool River. Many big trout lived in this beautiful stream. Mud Lake was clear, too. It was called Mirror Lake. There were big beds of plants in the water. There were many fish in the clear waters of the lake.

A thick layer of black soil covered most of the valley. The leaves which fell each fall gradually rotted into a thick layer of "humus" which enriched the land. Rain which fell on the forest soaked into the humus and was slowly absorbed by the soil beneath. It appeared again later as cool springs. The springs flowed all year, even during long dry spells.

The settlers liked this valley with its rich soil and its clear, cool springs and streams. They decided to live there. They cut down some of the tall trees and made log houses and barns with them.

Trees were cut to make room for fields and pastureland. The rich soil raised tall corn and good grass for the cattle.

In time, more of the forest was cut away to make room for more fields. A sawmill came to the valley. Many tall trees were cut into lumber and hauled to a faraway city.

After a few years, most of the big trees had been cut. In the hills, where they couldn't farm, people carelessly allowed fires to burn through the cut-over forests. This prevented young trees from growing up to replace the ones that had gone to the sawmill. It left steep slopes of bare soil.

In time, two towns appeared in the valley. Some factories were built there, too. More and more people moved to this area. As the towns grew, the farmers had more demand for their crops. They plowed more and more of the land, even on the hillsides.

The farmers plowed in straight lines, up and down hill. They thought it was easier than plowing along the hillsides. After heavy rains, the water ran down the plow furrows. It carried some of the rich topsoil with it.

The farmers noticed that some of the soil washed down hill, and that small gullies were made by the rushing water. They didn't worry, though. There was still plenty of good soil on the land.

As the soil washed into the clear, cool river, the water became muddy. This water muddied the lake, too. Some of the topsoil from the fields covered the gravel bottom of the river. Gradually, the fishermen in the valley were catching fewer trout in the stream, and fewer fish in the lake. The soil which covered the gravel destroyed much of the fish food. The muddy water prevented the growth of food, too. The fish couldn't see to find what food there was in the muddy water.

The towns discharged their sewage into the stream. Factories poured acid and other wastes into the water. The river and the lake would no longer support many fish. People who wanted fish for dinner had to go elsewhere to catch them.

In time, the land raised less corn and other crops. There was less rich soil to raise them in. The pastureland raised less grass for the cows to eat. Some of the land couldn't be plowed because big gullies had formed. The gullies grew bigger each time it rained, and the water rushed down them toward the river.

The rich topsoil kept washing away with each heavy rain. The remaining soil had little humus. As the good soil washed away, nothing but poor soil was left. It wouldn't raise good crops.

Now, the farmers had less to sell. So, they had little money to buy things with. The buildings didn't get the repair they needed. The farmers started to work in the factories. They couldn't earn enough money to live on by farming alone. They still raised some cows and tried to raise crops but the crops were poor. The cows gave little milk, too. They couldn't get enough good grass to eat.

When farmers first cleared some of the land, many deer came to the valley. You could see them any morning or evening. There were rabbits and grouse and many other wild animals. Later, when the woods had been cut and burned, and the fields were bare and eroded, most of the wild animals disappeared also.

Now, the people in the valley couldn't go fishing and hunting. They couldn't see the interesting wild animals, either. People couldn't swim in the muddy, polluted water.

Sometimes the river overflowed its banks. Flood waters covered parts of the two towns. At other times there was very little water in the river. Now, heavy rains flowed quickly into the river, causing floods. Little of the rain soaked into the soil, to appear later as springs. So, during dry summers, the springs no longer flowed. They no longer fed the river with water, and the river was very low during

long dry spells.

The farmers now had to drill deep wells to get water for themselves and their cattle. They could no longer get good cold spring water.

The two towns couldn't get good water, either. They took the muddy polluted water from the river and purified it. Taking out the mud and other impurities was expensive. The people now paid a high price for their water.

During dry spells, in summer, there wasn't enough water for all the needs. So, the people couldn't water their lawns. Sometimes the factories shut down because there wasn't much water.

This had once been a very pretty valley. Now it was unattractive. The buildings weren't painted. There were no green fields with good crops growing in them. The wild animals had disappeared. The people could no longer hear the bobwhite call, or hear the drumming of the grouse. They couldn't go fishing or hunting and they couldn't go swimming. Some of them couldn't earn much money.

Even now the people living in the valley don't really call their towns Mudville and Drabtown. They don't call their stream Muddy River. But, everyone else calls them by these names. So, that's what we called them on the chart, because the "nicknames" described them so well.

You wouldn't like to live in this valley. You couldn't have much fun there. You would want to live in a valley that had forests, good soil, clean water, and fish and wildlife.

CLEAR RIVER VALLEY

Some people came to Clear River Valley, too. Like the other valley, it was covered with tall trees. Here, too, the river was cool and clear. It was fed by cool springs flowing from the hillsides. These people decided to settle in the beautiful valley.

The settlers left another valley to come here. Like the people in Muddy River Valley, they had destroyed the forests and the rich soil. The stream in that valley, too, had become muddy and polluted. They left because they no longer like the valley. They couldn't go fishing there, and they couldn't swim in the waters. They couldn't earn much money there, either.

When these settlers came to Clear River Valley, they had learned an important lesson. They had learned that the topsoil is very important. They had learned that most of the rain must soak into the

ground if springs are to run and if rivers are not to overflow their banks.

The settlers decided that they would take good care of their new home. They would be careful about the woods, the soil, the water, the fish, and the wildlife.

These people cleared some land, too. They used the big logs to build their houses and barns. They cleared land for fields and pastures.

Most of the steep hillside was left in woodland. When big pine trees were cut, seed trees were left to start a new forest around the stumps. When other kinds of trees were cut, only a few of the big ones were taken each year, and there was room for the smaller ones to grow up and take their places. Each year only some of the trees were cut and sold. There were always more growing to be cut another

year, and every year the people had some income.

The settlers built a fire tower on top of the mountain. During dry spells a man would spend the day in the tower looking for smoke. If he saw any, he would call a fire warden, telling him where the fire was. The warden and helpers would rush to the fire and put it out. These people knew that the forest was important to them. They didn't want it destroyed.

The people were very careful with their fires. They put up signs warning visitors to be careful, too. Children were taught in school about the damage which could be done with a single match. They learned that a fire might harm the forest and the animals in it, and might even spoil Clear River and Clear Lake for fishing and swimming.

The farmers were careful not to feed too many cows on the pastures. If the cows were allowed to eat too much of the pasture there wouldn't be any grass to hold the soil, and some of it would wash away. Crops were planted as broad strips across the hillside. Each strip was a band of corn or hay or some other crop. Rainwater which washed out of a grain field would run onto the hay. Here it would soak into the ground. The mud would be caught here too. Some of the strips acted as dams to catch the water and let it soak into the ground.

The farmers knew that they needed good topsoil on the land. They knew that the rain must soak into the soil. The crops would be good if they took good care of the soil and the rainwater.

The people left brush thickets along the fences for wildlife cover. They like to hear the bobwhite call, and they like to see the many wild animals that lived in this cover. They and their children like to go fishing. Often, they fished in Clear River for a meal of trout, or in Clear Lake for some perch or other fish.

There was a good beach on Clear Lake. Children swam there every day during the summer. The

water was clear and unpolluted. They didn't need to worry about getting sick if they swam there.

In time, a town grew along Clear River. The people decided to call it Pleasantville because it was a pleasant place in a pleasant valley.

Pleasantville always had plenty of clear, clean water to drink. The water was taken from Clear River. Since it was so clean, it needed only a little treatment to make it safe for drinking. This didn't cost much. The people paid very little for their plentiful supply of good drinking water. It was plentiful because the people took care of the woods, soil, and water.

Pleasantville took care of its wastes. The town had a good sewage treatment plant. It didn't want to pollute beautiful Clear River. The wastes were removed from the water before it was discharged back into the river.

A factory was built above the town. It needed clean water to make good products. The company wanted to be a good neighbor, too. It wanted the good will of the people living in the valley. The factory built a treatment plant to take care of its wastes. It didn't pollute the river. It purified the water before returning it to the river.

The people in the valley were healthy. The crops and the milk were rich in mineral matter taken from the soil. The people who ate the food and drank the milk received the nourishment which their bodies needed.

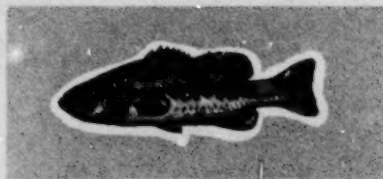
Pleasantville folks spent much of their time out-of-doors. They hiked in the woods. They went swimming in Clear Lake. Most interesting of all was the fishing. Nearly everybody in the town went fishing.

The people in Clear River Valley were happy and contented. The farms raised good crops. Farmers could buy the things they wanted from the money they got for the crops. You can see why people enjoyed living in this pleasant valley.

THE ANIMALS IN THE VALLEYS

LARGEMOUTH BASS

The largemouth bass likes clear, warm water. He likes to be near weed beds, too. There are many of these bass in Clear Lake.



The largemouth bass and the smallmouth bass are cousins. You can tell from the pictures which is which. The largemouth has a stripe along the side of its body, extending from head to tail. The smallmouth has a number of dark bars extending down the sides of the body.

Cut out the largemouth bass and paste it on Number 7 on the chart.

There are no largemouth bass in Clear River because these fish prefer warm water. Clear River is cold in its upper reaches and cool where it enters Clear Lake.

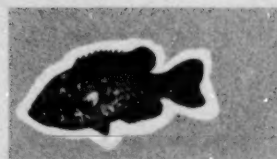
There are no bass in Muddy River or in Mud Lake, either. Not many kinds of fish can live in these waters. The soil washes from the land during rains. It keeps the water muddy. Not many kinds of insects, minnows and other food animals can live in muddy water. The bass, which feed by seeing their food, and catching it, couldn't see these creatures in the dark muddy waters, even if they were there.

In addition to the mud, the water receives sewage from Mudville and Drabtown. As this sewage decays, it uses up much of the oxygen in the water. Fish must have oxygen as well as food. Sometimes there is very little oxygen in Muddy River.

The factories are dumping acids and other harmful wastes into Muddy River. Most kinds of fish can't live in these acids and wastes. The waters of Mud Lake are polluted, because Muddy river flows into it.

In the clear warm water of Clear Lake, the bass have plenty of food. There are many small fish and insects for the bass to eat. There is plenty of oxygen in this water, too, and there is no pollution. So, Clear Lake has many largemouth bass in it; Mud Lake has none.

ROCK BASS



The rock bass likes to live in clear, cool streams. Water in the upper part of Clear River is quite cold, even in summer. So,

rock bass live in the lower end of the stream, where the water is cool, but not cold.

This fish is a member of the sunfish family. The striped bass, living along the coast, is sometimes called a rock bass, too. This big salt water fish isn't related to the rock bass in Clear River.

The Clear River rock bass eat many kinds of food, but water insects are the main part of their diet. The fish forage around the gravel and rocks on the stream bottom, looking for insects and small crayfish. When a land insect falls into the river while flying over it, the rock bass is glad to eat it, too.

If you were to go fishing on Clear River between the bridge and the mouth, you would very probably catch some rock bass. Often, these fish will be looking for food, even when most other kinds of fish aren't feeding.

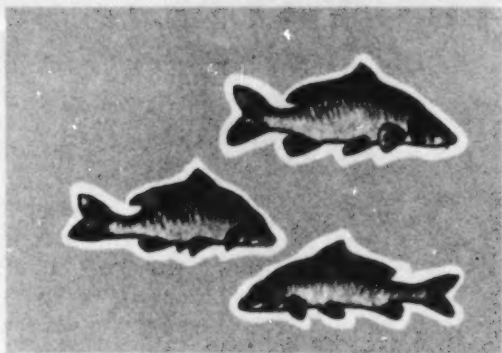
Cut out the colored picture of the rock bass, and paste it on Number 3 on the chart. Be sure to remember what we said about leaving the white border on the fish and animals when you cut them out.

There aren't any rock bass in Muddy River or in Mud Lake. Can you tell why they don't live there?

CARP

Finally, we have found a kind of fish which is trying to live in Muddy River and Mud Lake, even though these waters are muddy and polluted. The carp can't see to find food in this dirty water. There isn't much food in this water, either. The carp gets his meal by putting his mouth on the bottom and sucking in any small plants and animals which happen to be there. He can do this even though he can't see his food in muddy water.

The carp don't have much to eat in Muddy River or Mud Lake. Sometimes there isn't much oxygen for them to "breathe." Often pollution kills some of the carp, but a few manage to keep alive from day to day.



Cut out the three carp in the strip of fish and animals. You will find three Number 10's on the chart. Paste one carp on each of these three numbers.

SMALLMOUTH BASS



The smallmouth bass wants clear cool water. In many parts of the country he lives only in streams; elsewhere the small-

mouth lives in lakes, too. When we think of this bass we think of gravel stream bottoms, or gravel or rocky shoals along a lake. The smallmouth bass doesn't seem to like muddy stream or lake bottoms. Of course, he doesn't like muddy water either.

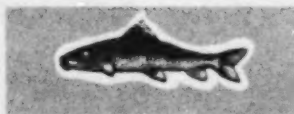
This fish likes to eat crayfish, and insects which live in the gravelly bottom. It will eat minnows, too.

Fishermen like to go fishing for the smallmouth bass. This fish will often leap out of the water when hooked. You can expect a good "fight" when you have hooked a big smallmouth.

In spring, the male bass builds a nest on the gravel bottom. He moves his body from side to side until he has made a saucer-shaped round "hole," several inches deep. After the female has laid eggs in the nest, the male guards it. If another fish comes near, he chases it away. After the young fish have hatched and left the nest, he has finished his homework for another year.

Cut out the colored picture of the smallmouth bass. Find Number 2 on the chart, and paste the bass on this number. You wouldn't expect to find Number 2 in Muddy River or in Mud Lake. The smallmouth couldn't live there!

SUCKER



Some suckers like to live in lakes, others prefer streams. The one on our chart likes cool streams, especially if the stream bottoms are gravel.

The fish is called a sucker because it feeds by sucking plant and animal life from the gravel on the bottom. As it sucks in water and food, the water passes out of the gill openings, and food goes into the stomach.

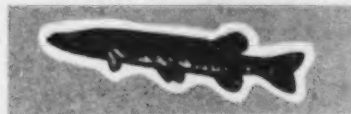
When a school of suckers moves along, taking food from the bottom, it reminds one of a group of miniature electric carpet sweepers, picking up things from the floor.

Because of its small sucking mouth, you wouldn't expect to catch a sucker on a minnow or a lure. Knowing that this fish feeds on the bottom, you wouldn't expect to catch it on a fly near the surface, or on a worm dangling some inches above the bottom.

Suckers are bony fish, but they are good to eat when taken from clear cool waters.

Cut out the colored picture of the sucker. Paste it on Number 4. As you expected, the sucker lives in Clear River, not in Muddy River.

PIKE



This fish happens to be a northern pike. In inland waters along the east

coast, we would find his cousin the chain pickerel. In some waters we would also find another cousin—the muskellunge.

The pike grows to a big size. To grow big, he must have lots of food. The pike has a very large mouth, with sharp teeth in it. If you will look at his mouth, you can tell what kind of food he eats. He wouldn't have a big mouth, full of sharp teeth, if he ate small insects. The pike eats other fish. If a mouse or a frog happens to swim in the water, he'll grab it, too. A big pike will even eat a young duck.

The pike will lie quietly near a weed bed, or move along slowly, looking for food. When he sees a small fish, he suddenly darts toward it, with his big mouth opening as he nears it. Sometimes the small fish escapes; sometimes it doesn't.

The pike wants clear water; he couldn't see his food in muddy water. The northern pike prefers

cool, weedy lakes; the chain pickerel prefers weedy lakes, too, but he will live in warmer water.

Cut out the colored picture of the pike and paste it on Number 6.

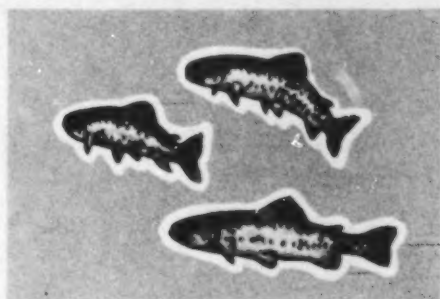
You still have a number of kinds of fish to paste on the chart. Even so, you can see already which of the two valleys you would want to go to if you decided to take a fishing trip!

TROUT

There are many kinds of trout. The best known kinds, in much of the country, are brook trout and rainbow trout. We also have brown trout, lake trout, cutthroat trout, Dolly Vardens, and goldens. All the trout species like cold clean water.

The trout for our chart are rainbows. They are called rainbows because they have a highly-colored stripe along each side of the body, reminding one of a rainbow.

Clear River is a trout stream. The water is cold, clear and unpolluted. There are stretches of this river where the water flows rapidly over gravel bottom. We call these riffles. Here the trout find insects to eat. The river has deep pools between the riffles. Here the trout rest when they aren't feeding. The trout like to hide under over-hanging banks and under the edges of big rocks.



There are many water insects in the clear cold water of Clear River. They thrive on the gravel and rocky bottom. The trout eat these insects. If mud and silt washed into the stream and covered the gravel, there would be fewer insects and less food for the trout.

In Clear River Valley the more hilly parts are covered with healthy forests. Where the land is farmed, the farmers are careful not to let soil wash into the streams. They need the topsoil on the land to raise crops. Foresters see to it that the soil in the forests is not washed away. They do this by preventing fires and overgrazing. In this valley most of the rainfall soaks into the ground when it falls. Later some of this water leaves the ground as cold

springs. These springs furnish most of the water in Clear River. That's why the river is cold.

After all but the heaviest rains, Clear River may rise a few inches but it doesn't flow over its banks because most of the rain soaks into the soil instead of running down into the stream. Floods would destroy much of the food of the trout.

There are three Number 1's on the chart. Paste one rainbow trout on each of them. Naturally, they are all in Clear River. Trout couldn't live in Muddy River.

YELLOW PERCH



There are many thousands of yellow perch in Clear Lake. Of course, we can show only a few of them. These interesting fish travel in groups which we

call "schools." Perch schools spend much of the day out in the open water of the lake. Toward late afternoon or early evening, they move inshore to the outer edge of the weed beds to find food. Here, they eat insects and minnows until nearly dark.

At dark, the perch lie on the bottom and stay there until daylight. Some kinds of fish feed at night; others feed by day. The perch is strictly a daylight feeder. We think he sleeps at night while he lies quietly on the bottom. But we can't be sure. Fish have no eyelids. Their eyes are wide open even when they are asleep. So we don't know when a quiet fish is just resting and when he is sleeping.

After daylight, the schools of perch have "breakfast" on minnows and insects and then move back to open water to spend most of the day there.

If you wanted to catch a mess of perch, you would fish in the early morning after daylight or in the evening before dark. You would expect to have your best luck if you fished at the outer edge of the weed bed.

As the perch seeks minnows and insects for their "dinner," the pike are seeking "dinner," too. A perch is an excellent meal for a pike. A small fish has two problems—it must find food and it must keep from being the food of some bigger fish! Of course, if none of the little fish were eaten by the bigger ones, there would soon be so many fish that the lakes and streams couldn't furnish enough food for them. A fish may have many thousands of brothers and sisters, so it is good that some are eaten by other fish and by people.

Cut out the school of yellow perch and paste it on Number 5. There are only three perch in this school. The artist would have put at least fifty perch in the school, but we didn't have room for all of them on the chart. If this were mid-day you would put the perch out in the open water. It's early evening, so you will put them near the weed bed.

CRAPPIE



Like yellow perch, crappies travel in schools. Usually perch are most abundant in cool northern lakes, but crappies tend to be found more in warmer, more southern waters. Sometimes we find both kinds of fish in the same lake.

We put them both in Clear Lake, together with the bluegill. These three are the favorite pan fishes of the sport fishermen. All were put in Clear Lake because we wanted your favorite pan fish to be there.

Crappies eat some insects but they much prefer minnows. They like to be near a weed bed or near a sunken log, tree, or old boat.

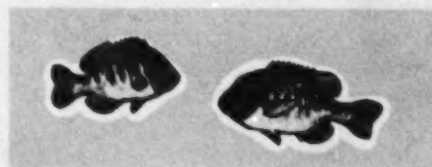
There are two kinds of crappies—the black and the white. The black crappie prefers to live in clear lakes; the white crappie often lives in the less clear

lakes and in big, warm streams. Even the white crappie couldn't live in Muddy River or Mud Lake, though, because these waters are too muddy and too polluted.

Cut out the colored picture of the crappie and paste it on Number 9, near the weed bed in Clear Lake.

BLUEGILL

The bluegill is the favorite fish of many boys and girls. He fights hard when hooked. Few fish taste as good as bluegills which are taken from clear, unpolluted waters.



The bluegills and largemouth bass like the same kinds of waters. You can expect to find bluegills in big weed beds or near their edges. These fish have very small mouths. They feed mostly on insects they find in the water and on the bottom.

Cut out the colored pictures of the two bluegills. There are two Number 8's in the big underwater weed bed in Clear Lake. Put the bluegills on these numbers.

Now you have finished putting the fish on the chart. There are many others which could be added, such as minnows, sunfishes, and catfish, but we don't have room for all of them in Clear River and Clear Lake. There is plenty of room for more fish

in Muddy River and Mud Lake, but most kinds of fish couldn't live there so we couldn't put them there.

Next, you will add some birds and other animals to the chart.

BOBCAT



At the moment the bobcat is walking through a thicket at the edge of the big forest. This is summertime and food is plentiful. The bobcat gorges himself on small mammals and birds.

During the daytime he rests in the shelter of a thicket, a hollow tree, or the recess of a rocky cliff.

The bobcat is active all year and is a good climber. Most of his hunting occurs around sunrise and sunset. He depends on his keen eyesight in locating prey. He remains in a resting place during

winter storms because it is difficult for him to walk in the snow.

The bobcat lives in heavy forest cover with second growth timber and much underbrush. He will search old fields and clearcuts for food but he seldom ventures very far over the ridge into the barren slopes of Muddy River Valley. There the trees have been cut down or burned. The bobcat wouldn't feel at home there. He likes Clear River Valley because there are big forests where he can find plenty of food and many hiding and resting places.

Cut out the colored picture of the bobcat and past it on Number 20.

GROUSE



The grouse lives on the tree-covered slopes of Clear River Valley. He likes a forest of mixed trees with many brushy openings. Aspen and willow buds are important winter foods. Here he can also feed on

berries and the fruits of other wild plants. At night he sleeps on the branch of a tree in the woods. He feeds mostly during the evening and early morning hours. During the day he often rests on the ground or on a stump.

At the moment, a female grouse with her brood of chicks is at the edge of a brushy clearing looking for insects. If you happened to come near, the hen would give a warning cluck to the chicks. They would all run and hide at once. Later, after you left, she would give another signal to her hidden chicks. They would leave their hiding places and hunt for food again.

There are many grouse in Clear River Valley. Here, careful tree cutting and managed forests have helped the grouse. The brush and young trees in cut-over areas have increased food supplies for these birds. Grouse don't live in Muddy River Valley because the trees have been destroyed there.

Cut out the colored picture of the grouse and past it on Number 19.

COWS

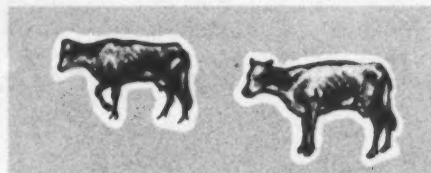
Not many wild animals live in Muddy River Valley because there are few places where they can find shelter from the weather and from their enemies. There are no trees and bushes along the fences where rabbits, quail, pheasants and other wild animals could hide. There isn't much food for some of these animals because too many cows in the valley keep the land overgrazed.

Much of the topsoil has washed away through the years, because the people burned the woods, because they plowed up and down hill and because they tried to raise more cows than the grass on the land could feed.

With the grass destroyed, the valuable topsoil washed into Muddy River. That is why the river is muddy. Whenever there is a heavy rain, most of the water rushes down hill to the river. Very little is held back by grass and other plants and allowed to soak into the ground. Rushing water carries mud with it. Often, flood waters in this river overflow its banks. During long dry spells the water in the

river is low and springs on the hillsides are dry. If more water were trapped by plants and stored in the ground, as it is in Clear River Valley, some of it would flow out all summer from the cool springs. Then the river wouldn't flood during heavy rains and wouldn't be so low during dry spells.

Most of the rich topsoil has washed from the land in Muddy River Valley. Now the land is poor and will not raise good crops of grass. The cows that graze on this land are thin. They don't give much milk. The milk they do give isn't rich with cream, like that from cows which eat their fill of good grasses.



Cut out the colored pictures of the two underfed cows. Paste them on the two Number 22's. The cows are thin and they don't look very contented. So, you know which valley they live in!

The cows in Clear River Valley have plenty of good nourishing food. Here the pastureland isn't over-grazed and the topsoil and mineral matter haven't been washed away.

MALLARD



During summer mallard ducks like the shallow marshes where they can find water plants to eat. These, and water insects, are their main food. At

night they rest on small islands of marsh plants or swim to open water. When fall comes, they may start feeding on corn or other grains in the fields. With freezing weather, most ducks will fly south for the winter. In the spring the hen will return, with a mate, to her old nesting place in this marsh. The drake doesn't help with the nest, and he doesn't help raise the ducklings. The hen hatches the eggs and raises the brood.

The mallard couldn't live on Mud Lake. There isn't any duck food in this water. The mud in the water shuts out the light. Green plants must have light or they can't grow. That is why there aren't any marsh plants in Mud Lake.

Cut out the colored picture of the mallard duck and paste it on Number 21. As you expected, you will find this number in the marsh bordering Clear Lake.

DEER



This doe deer lives at the edge of the big forest. During the day she and her fawn rest hidden among the ferns in the woods. Toward evening they have a drink of cool water from the clear brook which flows nearby.

Then they walk to the area where loggers had cut the big trees last year. Here they can find all kinds of little trees and shrubs to feed on.

Earlier in summer, when the fawn was very young, the doe left it hidden in the ferns while she went to feed in the clearings. Now the fawn goes with her wherever she goes.

The doe eats leaves, buds, and small twigs from shrubs and young trees. If there were too many deer, they would soon destroy all of the small "seedling" trees and there would be no new trees starting in the forest. There are plenty of seedlings in the Clear River Valley forests—far more than will have room to grow. So, the deer can eat some of them without harming the woods.

There isn't much food for deer in the center of the forest, where all the trees are big. She can't reach the leaves on tall trees. There aren't many ground plants in this kind of woods because the big trees shut out most of the sunlight. So, the deer and her fawn must find their food in the area where big trees have been cut for lumber, and where smaller trees and shrubs are growing.

The doe crosses the ridge into Muddy River Valley only in early spring when some choice weeds are young and tender. She doesn't go far, though, and she doesn't stay long. Deer don't like to stray very far from the protection of the woods.

The deer and her fawn are in the edge of a pine forest, in an area where most of the trees were cut a few years ago. The foresters were careful to leave a few seed trees, though. In the hardwood forest, for example, in the woodlot where the fox squirrel lives, only a few of the biggest trees are cut each year.

Cut out the colored picture of the deer and her fawn. Paste it on Number 16.

We show only one fawn. We really should have shown two. Where the land is good, and food is plentiful, deer often have twins. Where there isn't much food deer have only one fawn or perhaps none at all.

FOX SQUIRREL



The fox squirrel likes to live in farm woodlots, especially if the farmer has left a few "den" trees—hollow trees in which the squirrel can build her nest and find good shelter for the winter.

Squirrels will build nests of leaves and twigs up in the branches of the trees, but they prefer to use the cavities in trees, which are better protection from wind and rain.

During the fall, the squirrels bury nuts and acorns in the ground. In winter they dig some of this food up and eat it.

Some nuts and acorns are forgotten. They grow and become little trees.

Cut out the colored picture of the fox squirrel and paste it on Number 14. There are no fox squirrels in Muddy River Valley. Here the trees have been destroyed. The squirrels would find no homes and no food in this valley.

QUAIL

When farmers in Clear River Valley wake up on a spring morning, they can hear the cock quail calling "bob-white" from the nearby fields. At times during the day, the hen can be heard calling, too.



The quail builds her nest in a brushy fence-row beside the field. The male stays close by while the female sits on her eggs. When the young have hatched, both parents look after them. One parent will be watching for enemies while the other helps them find food. Quail eat insects and weed seeds.

When the chicks are young and downy, the mother quail covers them with her body feathers to keep them warm and dry. After the young birds are well grown and have their feathers the whole family will roost on the ground in a circle at night. All tails will be together and the heads will point outward. Sitting in a tight circle keeps the birds warm.

It also helps the flock to escape if an enemy comes near because the enemy can't "sneak" up without being seen by one of the birds.

Quail like to feed in the fields, but they want to be near plants they can hide under if a hawk or fox happens by. The fields in Clear River Valley are planted in strips. The strips of grain give the birds cover as well as food. The strips between the grain fields produce hay. The farmers plant their hillside fields in strips so that the soil can't wash away. If soil and water start to wash down the grain fields, they soon reach the strip of hay. Here the water soaks into the ground, and the soil from the grain field doesn't wash on down into the river. The quail always have food and shelter in Clear Creek Valley.

Actually, the quail travel in flocks, which we call "coveys." In summer, a covey is usually the two parents and their brood. In fall, several family groups may join the covey. We show only three quail on the chart. Each one represents a covey of a dozen or more birds. Cut out each of the three quail and paste one on each of the Number 12's.

There are no quail in Muddy River Valley. There aren't any thickets or brushy fence-rows in this valley. The quail couldn't find shelter there. In Muddy River Valley the farmers don't hear the cheerful call of the bobwhite in spring.

GRAY SQUIRREL



In many ways the gray squirrel resembles his cousin, the fox squirrel. Like his relative, he will live in woodlots but he prefers the bog woods.

In Clear River Valley, you would expect to find the gray squirrel in the big forest and the fox squirrel in the farm woodlot.

There are many gray squirrels in the big woods. Here they find acorns, nuts and pine seeds to eat. They have both shelter and food in the forest. Of course, there are no gray squirrels in Muddy River Valley. Here they would have neither shelter nor food.

Cut out the colored picture of the gray squirrel. Paste it on Number 15.

MUSKRAT



Musk rats live in the marsh. Here they build their homes of cattail stems and mud. The houses have underwater entrances. Some of these homes have several rooms, with separate entrances. The female raises her young in one of the rooms, other muskrats may live in a different room.

The muskrats eat the roots and tender stems of some of the marsh plants. When it eats, a muskrat will sit on its hind legs while it holds the food with its "hands."

If you sit quietly near the marsh toward evening, you may see muskrats swimming in the water. They may be putting more stems or mud on the house, or they may be getting food. These animals are most active at night. During the day, they sleep in their houses, or in burrows in the ground at the edge of the marsh.

As you may have expected, there are no muskrats in Mud Lake. Here they would have no tender plants to eat or stems to build their homes and nests.

Cut out the colored picture of the muskrat. Paste it on Number 18, in the marsh bordering Clear Lake.

WOODCHUCK



Some places the woodchuck is called a groundhog. Or you might know him as the whistle-pig. He's really not a pig at all, but he does whistle when frightened.

The woodchuck builds an underground home at the edge of a hayfield or pasture. He digs long burrows in the ground. He spends the night in the underground home. During the day, when frightened, he quickly runs into his home to escape his enemies. All winter long, he sleeps there.

In the early morning and evening, the woodchuck eats clover and other plants in a nearby hayfield or pasture. He stays fairly near his home, so that he can disappear quickly if a fox or some other enemy tries to catch him. If the weather is nice, the woodchuck may sun himself for a long time at the entrance of his home. He sits on his hind legs as he looks around.

Woodchucks eat some of the farmer's hay, but they don't do much damage, unless there are too many of them. They help the rabbits because the woodchuck's burrows make good hiding places, and warm winter homes.

The woodchuck which you will paste on the map is sitting in front of his burrow. Cut out the colored picture and paste it on Number 17.

THE PHEASANT



When the settlers first came to Clear River Valley, they didn't see any pheasants. There weren't any "ringnecks" in the

valley. In fact, there weren't any pheasants anywhere in North America. These birds were introduced from Asia.

Pheasants like to live in good farm country. In fields of hay, corn, oats, wheat and other crops, they find weed seeds and insects. Pheasants eat some grain but most of it is what was left after the crop was harvested. Pheasants find shelter in tall grass and brushy fence rows and they often nest in strips of alfalfa or hay.

The male pheasant is a very attractive bird. He has a long tail, and brightly colored feathers. Often, you can hear him crowing on a spring morning. The female is much less attractive. Her brownish color protects her. A fox or some other enemy could find the highly colored male much more easily than he could find the female.

Cut out the colored picture of the male pheasant. Paste it on Number 13. Knowing that the pheasant likes to live in rich farmland, with brushy field

borders, you already know where you will find Number 13. You will not find it in Muddy river Valley.

RABBIT

There are many cottontail rabbits in Clear River Valley. Here they have plenty of food and many hiding places. There are brushy fence rows and brier patches. Cottontail rabbits often use the burrows built by woodchucks.

Many kinds of animals eat rabbits. Even so, there are plenty of rabbits where they have good places to hide, because rabbits have several families of young each year. In Muddy River Valley there are few hiding places. Here most of the rabbits are caught by cats, dogs, foxes, owls, hawks, and other enemies.



In Clear River Valley the rabbits live at the edges of the fields and woods. Cut out the colored pictures of the three rabbits. Paste one on each of the three Number 11's on the chart.

Many other animals live in Clear River Valley. There are wild turkeys in the big forests. Several bobcats live there too. In a walk through the wooded mountainside, you might see a porcupine high in a tree, eating bark and new twigs. Red fox and gray fox visit the valley. A mink lives along Clear River. Colonies of beaver have dams and lodges on several of the streams. Of course, there are many kinds of song birds, and some hawks and owls.

You could put many kinds of animals in Clear River Valley, but the chart would be much too crowded if we tried to show all the different kinds. There's plenty of room for these animals in Muddy River Valley part of the chart. We can't put them there because most kinds of wild animals wouldn't care to live in this valley. Animals need shelter to protect them from their enemies and the weather. They must have food, too. There isn't much shelter or food for wildlife in Muddy River Valley.

ABOUT YOUR VALLEY

Most of us live in a valley. Probably you live in one. Do you know about your valley? Do the people there take good care of their soil and water, and their forests and fish and game? You might want to make a conservation chart of your valley.

You will enjoy learning about your valley. Visit the town water supply plant and learn how the community gets its drinking water. Learn how the water is treated. Do towns pollute the stream? Do the factories pollute them? Do farmers take good care of the soil? Is the all-important topsoil washing away? Visit a farm, if you don't live on one, and learn what the farmer is doing to save the soil. Visit several factories to see how much clean water they use.

Are the forests in your valley protected from fire? Are the trees being cut faster than they should be, or are new trees taking the place of those which are cut? Have a forester tell you about forestry in your valley.

What kind of wild animals live in your valley? You can see some kinds by driving along country roads in the early evening. You can see others if you will take hikes in the fields and woods. A game biologist will be glad to tell you about the wildlife in your valley.

Visit the streams and lakes. Is the water clear? Is fishing good in the waters of your valley? It will be good if we take care of the soil and water. Even our fishing depends on how the farmers take care of their land and on how the foresters take care of the woods.

If you have never fished, be sure to try it. Once you have learned to fish, you will go often. Many a

fisherman would be glad to take you with him and to teach you how to catch fish. A fishery biologist will be glad to tell you about the kinds of fish in your valley, and how they live.

Remember that what we do with our soil and water, our forests, and fish and game, will decide whether we have a good valley or a poor valley. People can destroy these important things by misusing them. But, we can restore them, too, though we can't do it in a hurry.

Muddy waters will become clear again if we learn to keep the soil on the land. The springs will flow again if we allow most of the rain to soak into the soil. We can do this by growing trees again on steep slopes, and by strip-farming.

When clear springs flow again, when the soil is kept on the land, and when pollution is stopped, there will be fish in the streams again, and you can go swimming there, too.

Even a valley that has been mistreated can be restored again. If you live in a valley where the people have taken good care of the land, the water, forests, fish and wildlife, do everything you can to help protect these resources. If you live in a valley where the resources have been misused, you and the other people can help to restore them.

Our country will be great and strong, and its people will be healthy and happy, only so long as we take good care of our all-important resources—our water, land, minerals, forests, fish and wildlife. These are so important that you must help to take care of them, too. All of us must guard well those things which make America great and strong, and its people healthy and happy.